

digit **FastTrack**

YOUR HANDY GUIDE TO EVERYDAY TECHNOLOGY

To Maya

Take your first steps into
the world of 3D modeling
and animation

- 🔵 **Getting started**
- 🔵 **Interface**
- 🔵 **Modelling**
- 🔵 **UV Mapping
and texturing**
- 🔵 **Basic Animation**
- 🔵 **Dynamics**
- 🔵 **Lighting**
- 🔵 **Rendering**
- 🔵 **Additional Features**
- 🔵 **Tutorials**

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YOUR TECHNOLOGY NAVIGATOR

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Fast Track to

Maya



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Published by 9.9 Mediaworx

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January 2010

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Introduction

Animation is an art that has risen in the last century. While art forms such as drawing, sculpting and painting allow artists to form shapes that can be represented as 2D (two-dimensional) images, animation lets you explore a new world. As the saying goes for the people working in the animation industry, “We are people who make imagination come real”. Through animation, new worlds can be imagined. This art form goes through the movement of a sequence of drawings or rendered images. In the last couple of decades the impact of 3D computer graphics has been immense.

You’ll find Fast Track to Maya a perfect solution, irrespective of whether you’re an amateur CG artist or you’re just migrating from another 3D platform. It introduces you to Maya and shows how you can work with Maya to create your art / rendered images, whether it’s animated or static in design.

This book exposes you to all the facets of Maya, by introducing and explaining its tools and functions and help you understand how Maya operates. We’ve included the most interesting tutorials within the scope of this Fast Track, so that you can have a start without getting bogged down by the immense functionality within Autodesk Maya. Working through these will give you skills as well as knowledge. These tutorials expose you to various ways of accomplishing tasks with this intricate and comprehensive artistic tool.

Learning Maya can be overwhelming, but the key is in practising and accepting disappointments. Persistence and continuous practice will see you through your desired results. 

1 Getting started



AUTODESK MAYA



A number of people use Maya, including people who want to just know about 3D computer graphics (CG), 2D artists who create caricature animation for film and television, artists who make high dynamic landscapes and those who work on animated short movies. Every CG artist has a basic understanding of this software.

1.1 3D Modelling

3D modelling is all about creating models of objects or illustrations, which can be defined from all angles. The best way to describe this is by modelling an object from clay or wood, instead of software used for creating three-

BROCHS AUTODESK MAYA





dimensional shapes or geometry. Just as sculptors use clay to model objects in the real world, 3D modelling artists sculpt the object in a virtual 3D application such as Maya.



There are three types of surfaces that an artist uses for modelling. They are polygon surfaces, NURBS and subdivision surfaces.

Polygon

Polygon modelling can be best described as a mesh created with a number of flat surfaces. The mesh can be modified (the surfaces can be added or subtracted) according to the results you want to achieve.

NURBS

A NURBS surface is made up of intersecting curves – these are less flexible when an artist needs to create a complex geometrical object.

Subdivision

Subdivision modelling entails the qualities of both of polygon and NURBS surfaces. This type of modelling is used to make the most complex part of the geometry or model that you want to create – such as a ear and nose.

1.2 Animation

This is a way of adding some life or action to an object that would otherwise be static.

Animation not only represents character animation, it also means that you can form, deform, change and metamorphose objects. Animation also helps to give your character expressions and emotions.




According to Walt Disney, “Animation offers a medium of story telling and visual entertainment which can bring pleasure and information to people of all ages everywhere in the world.”

1.3 Dynamics

Wind, water, fire, smoke and any other natural phenomenon falls under

this category. Anything that has something to do with these and physics simulations is categorised as effects. As a general term, effects animation differs from animation. Natural effects which cannot be produced by the means of a key frame (animating frame by frame) animation are created by effects.

Follow the instructions below to make a decent beginner's scene. This will give you an overall understanding of how Maya works. Later, you can add your own effects, simulations, lighting effects, animations and models and create your own scene. This software has the same look and feel in all operating systems (Windows, OS X). 

2 Interface overview

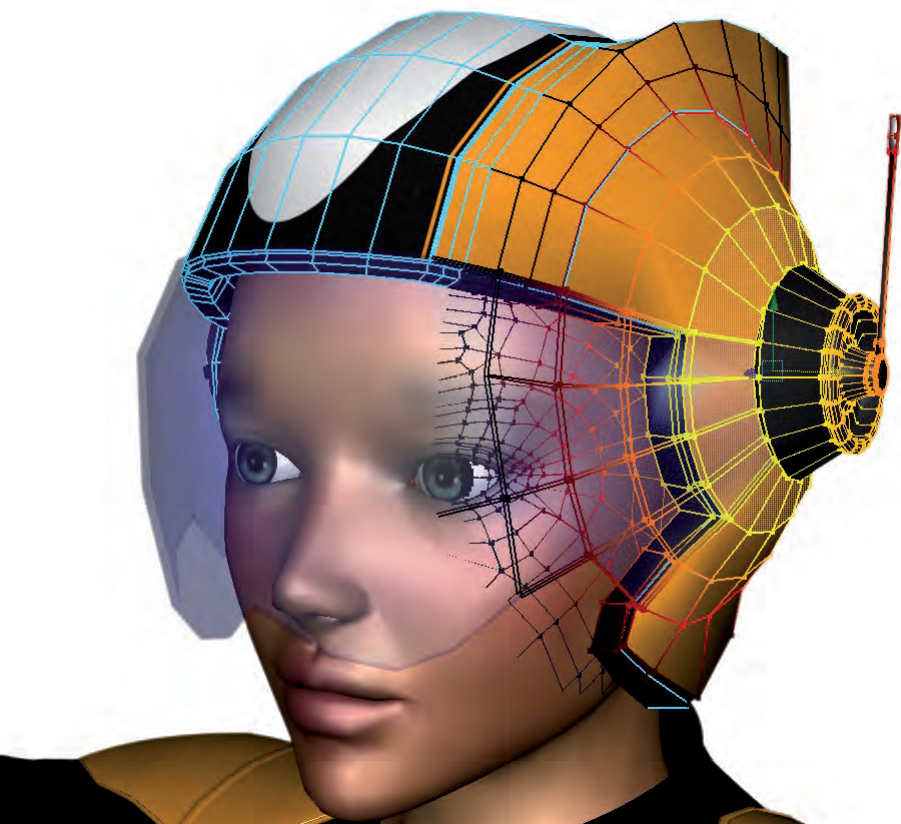
A piece of software with so many buttons and icons spread all over the window can be quite a pain. But once you start exploring it, you will find all those buttons in the Maya interface useful. To help you understand this software, we will try and keep it simple and straightforward and explain all computer graphics jargon that we come across.

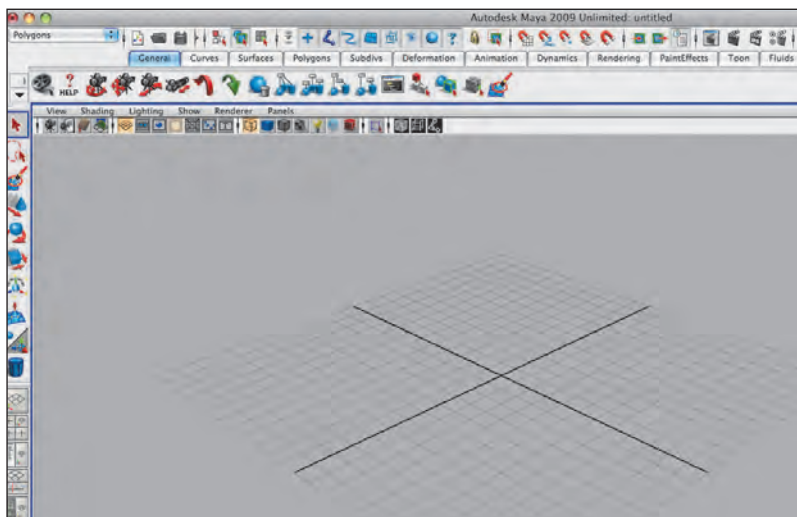
2.1 Basic Tools, Menus, Windows and Editors

When you first start Maya, you'll see the perspective view. In the vertical rectangular white area on the right hand side, you have the 'Channels View' and below that, you have 'Layers'.

Menubox

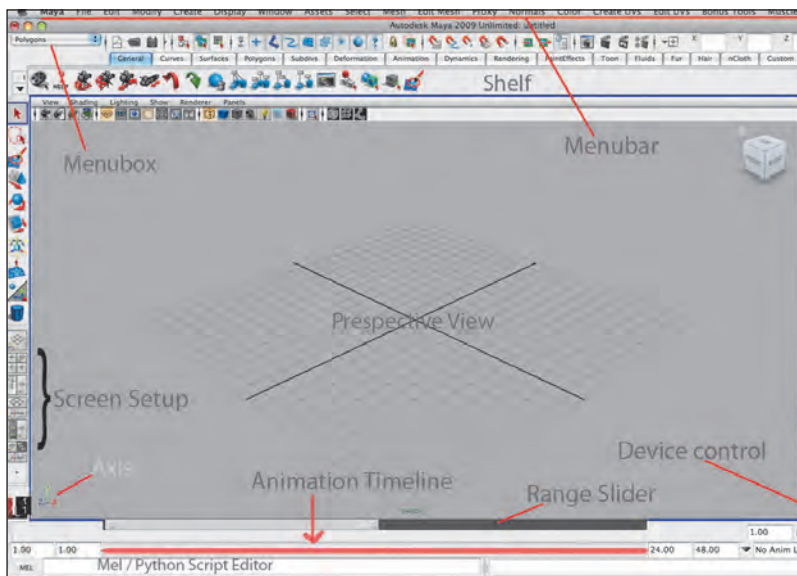
When you click on this, a drop down box will appear, from where you can choose the various modes in Maya.





The Maya interface is your playground

For example, if you need to create an animation, or need to use a skeleton, choose Animation from the drop down menu. If it has something to do with fire,

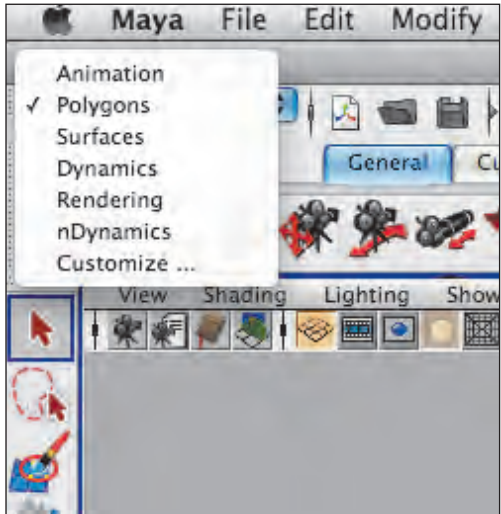


Spend some time getting familiar with the Maya interface

wind or clouds then use the Dynamics option. Once an option is selected, the menu bar modifies itself in such a way that all the tools related to that category are lined up for the artist.

Shelf

This is where all the shortcuts of the tools are placed, regardless of the menu. Each tab you click opens up a set of tools. 90 per cent of the tools in Maya are located in the shelf, unless you install third-party plug-ins or scripts, or make your own custom shelves.



Select your mode from the drop down box



You'll find most tools in the shelf

Channel Box Editor

In this box editor, when you select the object that you create, it gives you a numerical value of how big the object is according to width, height, radius, and also the translation coordinates for where your object lays in the 3D space.

Layers

Layers separate one object from another. This is again defined by you. You can set as many objects as you wish to be in one single layer. This is an important feature when you are finishing up your scene and getting ready to render it.

Toolbox

This is where you find the physical controls of the object. In Maya, if

you hover over any icon you can see a description of that tool at the bottom of the page.

Bounding box Selection tool is used to select objects, faces, vertices, edges and UVs.

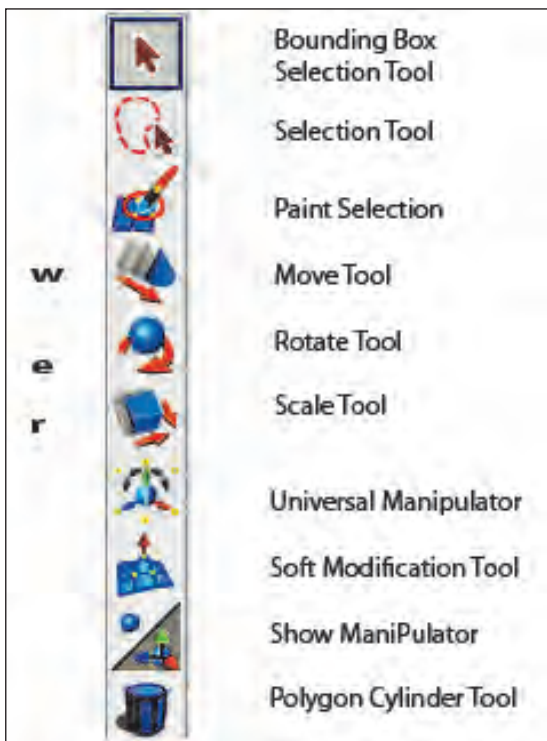
Selection tool or the lasso tool is used when there are complex models and you need a curved selection instead of a box.

Paint Selection Tool is used to select vertices in a complex mesh smoothly. Wherever you move your brush, you can select vertices.

- The Move, Rotate and Scale tools:

these are widely used in Maya for just about everything. They're used to move, rotate and scale objects respectively.

- Universal Manipulator: This has the function of move, rotate and scale in one feature. Can be handy sometimes.
- Soft Modification tool: A soft modifying tool is used to deform vertices smoothly in an object.
- Show Manipulator: This is used if there is a manipulator attached to a node.
- Polygon Cylinder tool: This is used to make a polygonal cylinder, as the name suggests.



If you're not sure what a particular tool is, just hover over its icon and read the description at the bottom of the page

Shortcuts

These are effective when an object is selected. Make sure you have turned

off Caps Lock.

[W]: to move the object in X,Y or Z axis

[E]: to rotate the object on any axis

[R]: to scale the selected objects

Screen Setup

This is fairly simple to understand. You can click on any of the buttons and then see how the layout changes. This allows you to adjust the display according to your wishes.

Animation Timeline

Just as with any other timeline, this shows you which frame you are on.

Range Slider

This is simply a slider used to isolate the frames on which an artist wishes to work.

Mel/Python script editor

This is where you input commands and execute your scripts. The icon on the extreme right of the same line is used to expand the editor and typing area, so that you can see more than a single line of script.

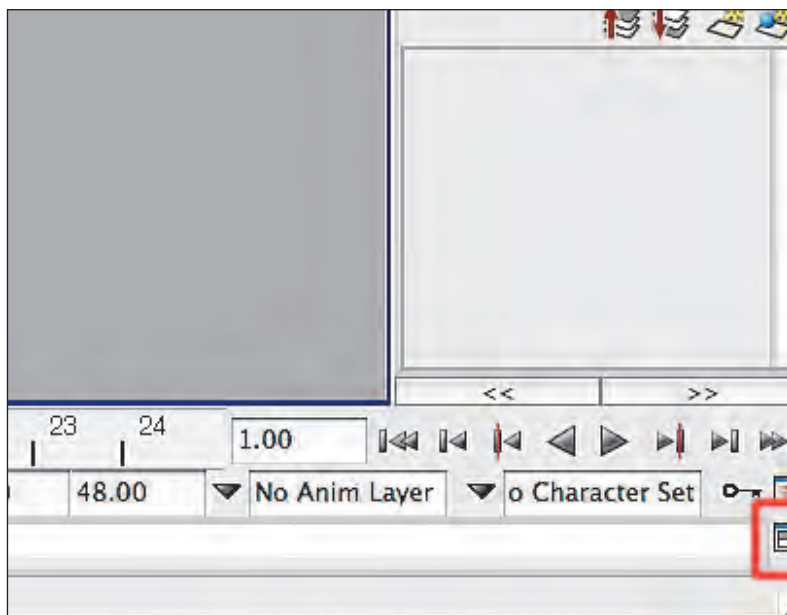
The Attribute Editor

This lists the attributes of the selected object and is a larger version of the Channel Box. The Channel Box shows you the compact version of the object's attributes, whereas the attribute editor gives you full control of each and every attribute of the object. Each tab on the attribute editor represents a set of information for the selected object. This is arguably the most important tool in Maya.

You can activate the Attribute editor by clicking on the red coloured area. You can also select the object and click [Ctrl] + [A] on both Windows and Mac to activate this. The section marked in Red is the Attribute editor. All the shortcuts for the Windows, Linux and Mac OS X version are the same.



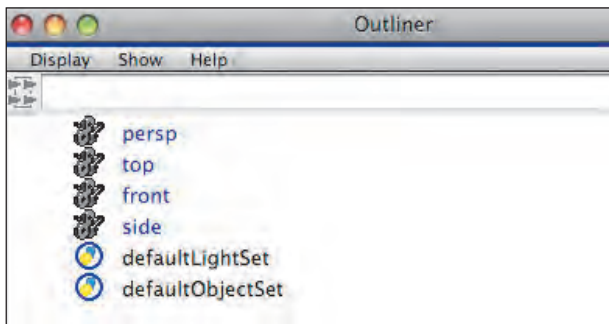
This is fairly simple to understand. You can click on any of the buttons and then see how the layout changes. This allows you to adjust the display according to your wishes



If you need to replicate, why rework? Use scripting

Outliner

The Outliner is a window where all the objects and attributes in your scene are compiled. You can hide objects by selecting them and pressing



[Ctrl] + [H] Hide/Unhide is as simple as [Ctrl] + [H] and [Shift] + [H]

and unhide

them by going to Windows > Outliner, selecting the object and pressing [Shift] + [H].



StatusLine

The Status Line

You won't be using this a great deal in the scene that we are going to work on, apart from the first four and the last four buttons. These are: Menu select, New scene, Open scene, Save scene, and, Render, IPR render, Render globals and text-based selection. There is another set of buttons in each viewport.

Here is a short explanation of these buttons, from left to right:

- This is used to select a camera. If you are viewing a scene, which has at least 10-20 cameras, and Camera 1 is your viewing camera, if you click this button, your viewing camera will be selected.
- This also selects the camera attributes. Every object has attributes. If you need to change the focal length or the resolution, this is the button you would use.
- To put bookmarks on the camera.
- To add an image plane.
- To toggle the grid ON and OFF.
- To add a film gate.
- To add a resolution gate.
- Adding a mask to the gates.
- Switch the field chart ON and OFF (field chart represents the 12 standard field animation cell sizes).
- Switch Safe action ON and OFF (This is a viewing box where you should keep all your actions and animation sequences inside this area, if you are working on a production).



ViewportBar

- Toggle safe titles ON and OFF (this box defines the region where the Titles / Subtitles can be added to your scene).
- Object Wireframe mode ([3])
- Object shaded mode ([4])
- Object wireframe and shaded mode. ([5])
- Object textured mode ([6])
- Using all lights
- Using shadows
- High Quality
- Isolate selected objects
- X-ray
- X-ray active components
- X-ray joints

File Menu

Open Scene: Open an existing scene on your computer and/or an external drive. You can also press [Ctrl] + [O].

Save Scene: Save the current scene. Alternatively, press [Ctrl] + [S].

Save Scene As: Save your file in Maya ASCII or Maya BINARY file format. Maya ASCII is an editable file format, which can be opened in various versions of Maya. It has a much larger file size, whereas Maya BINARY is compacted and is unusable with other versions of Autodesk Maya.

Import: Useful for importing other scenes or objects that can be read by Maya. Use the keyboard shortcut [Ctrl] + [I].

Export All: Exports all the objects in the current scene in user specified formats for access by other applications.

Export Selection: Similar to export all, except that it exports the selected object(s).

Window Menu

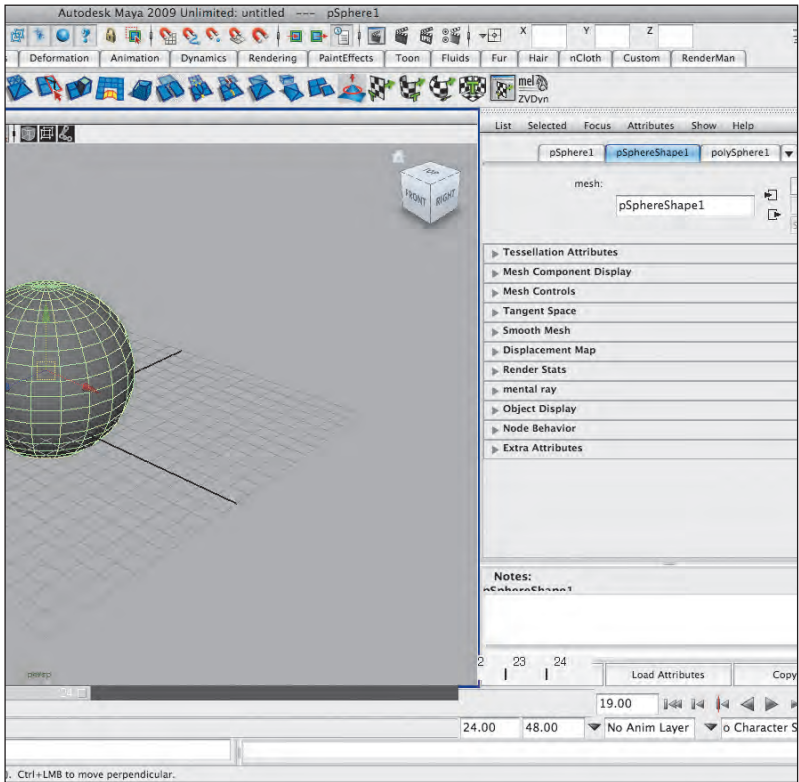
This is one of the most important menus, and consists of:

- General Editors
- Rendering Editors
- Hypershade

- Animation Editors
- Relationship Editors
- Attribute Editor
- Outliner
- UV Texture Editor
- Playblast

The Hotbox

If you hold down the space bar, you will see a cluster of menus that pop up on your screen, centred around the cursor. This pop-up menu is called the Hotbox. You can change and customise the hotbox by holding down the space bar and left mouse button. Any viewport can be changed into



Even creating 3D objects are as simple as drag and drop

any of the orthographic views or perspective views if you hold down space bar and right-click.

While still holding the right mouse button down (a smaller marking menu will appear), drag your mouse to the option you want to enable or disable). For example, to show all the menus in the hotbox, hold down the Space bar and right-click on the “Maya” and drag to “hotbox styles”.

2.2 Navigation and creating an object

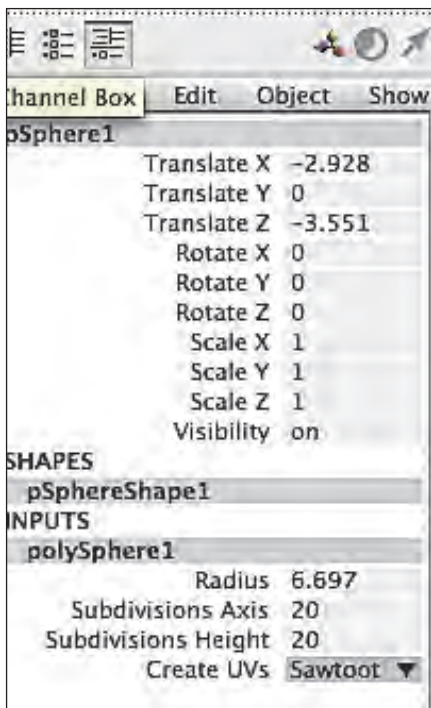
2.2.1 Navigation

To navigate in Maya, you need a three-button mouse. With [Alt] pressed, pressing the left button of the mouse in the perspective view panel will tumble your view. Similarly, holding down the [Alt] key and pressing the middle mouse button in the view panel will track or pan your view. On the other hand, holding down the [Alt] key and pressing the right mouse button in the view panel will dolly your view. The track and dolly moves also work in most Maya windows, such as the Hypergraph (an area where all the nodes which are in the scene are displayed), not just in the view panels.

[Alt] + right-click and drag mouse (up and down or sideways) in a viewport to zoom in and out. Scrolling the wheel (if you have a wheel mouse) zooms in and out. [Alt] + left-click and drag mouse around the viewport to rotate it. [Alt] + Middle mouse button to Pan inside the viewport.

2.2.2 Creating an object for navigation purpose

Select Polygons from the Menu box and go to Create > Polygon Primitive > Sphere. You can always pick other shapes such as a



You can edit components of your object by going to the channel box

cylinder, cube or pyramid. Next, drag anywhere in the viewport, to create a sphere in 3D space.

Once you have created a sphere, you can then look on the right side at the Channels Box – this will no longer be blank. The new values it contains are related to the selected object, which in this case is the sphere.

After creating the sphere, hit the hot key [W] on your keyboard and you'll see a tool that's pointing in various directions. Try left-clicking one of the three arrows and move it around. You'll notice that the object moves, and the translate x, y and z values in the Channel Box change. The translation values tell you where the object sits in Maya's 3D space. Now try hitting [E] – this will display four rings around the object which are basically for x, y and z rotation. Similarly, when you press [R], you can scale the object accordingly.

Now that you have created an object and are familiar with the Channel Box, let's see how to change the segments of the shape.

In the Channel Box, under the values for Translate, Rotation, Scale and Visibility, you'll see a section called SHAPES with a subsection called INPUTS. Here, you will find polySphere1. Click on this to see how the selected mesh or geometry has been created.

In this example, it's a polygon sphere and there are no other polygon spheres in the scene, hence the name polySphere1. If you click on a value such as Radius, it becomes editable so that you can change the size of the radius according to your needs. The Subdivision Axis and Height are the curves that you see around the geometry. If you change any of these values, you will see these changes reflected in the mesh.

Hotkeys: There are a number of hotkeys in Maya and you can further customise the list. The basic ones are:

Common Hotkeys used in Maya:

- [F1] Maya Help
- [F2] Animation menu
- [F3] Modelling menu
- [F4] Surfaces menu
- [1] Rough NURBS smooth/Actual polygonal preview
- [2] Medium NURBS smooth/Polygonal smooth mesh display
- [3] Fine NURBS smooth/Polygonal smooth preview
- [4] Wireframe mode
- [5] Shaded mode
- [6] Hardware texturing

[7] Show light simulation
[Q] Select tool
[W] Move tool
[E] Rotate tool
[R] Scale tool
[T] Show manipulators
[Y] Last tool selected
[S] Sets a keyframe
[F] Frame selection in current view
[G] Repeat last command
[Ctrl] + [G] Groups selection
[P] Parents first selection (or more) to last selected
[Shift] + [P] Unparents first selection (or more) to last selected
[V] Snap to point
[B] Resizes artisan brush
[X] Snap to grid
[Ctrl] + [Z] Undo
[Shift] + [Z] Redo
[+] Increase manipulator size
[-] Decrease manipulator size
Hold Spacebar to show hotbox

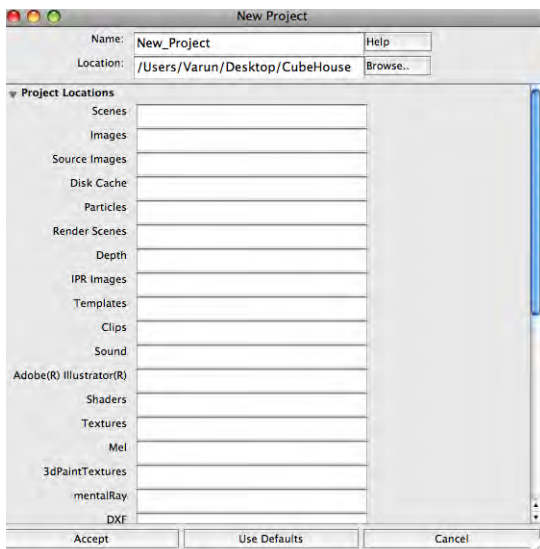
Now that you have seen what the basic display of Maya looks like, let's jump inside and have a look at the contents of the most frequently used menus that will be handy for a basic work flow. **d**

3 Modelling

Before we can start modelling, we need to set the project in order to save our scene files in a single location. To do this, go to **File > Project > New**.



You can set any name for the project. For now we'll name it `Cube_House`. Make sure you create an empty folder on your hard drive and browse to that folder. Click on **Use Defaults** (at the bottom of the dialogue box), which will fill up all the boxes with particular names and then press **Accept**. This will create a number of folders in the folder that you have



Fill the relevant information to organise your work

selected as the location for your project. After creating a project, you can save a file by giving it the name CubeHouse, or anything suitable, and it will be saved into the scenes folder of the same location.

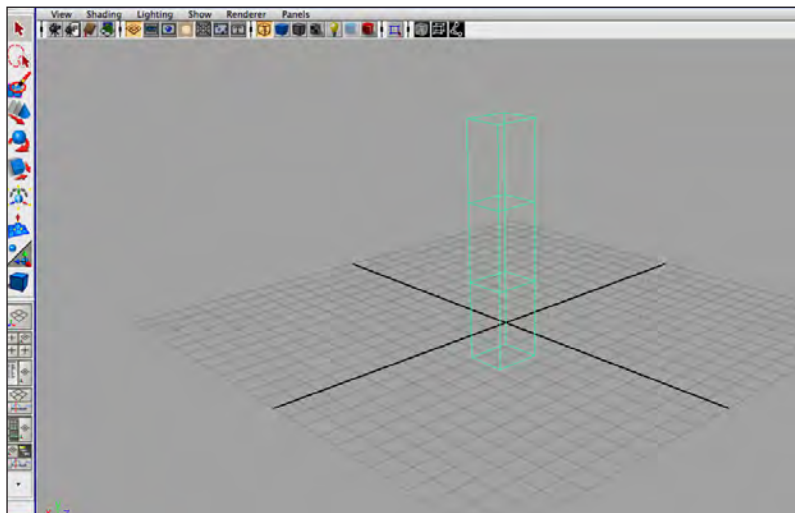
3.1 Polygon Modelling

Let's start off with a cube this time. Go to Create > Polygons Primitive > Cube, then drag and click twice in the viewport to create the object. Just to have a better look from all directions, we shall rotate the viewport and

even zoom in to some sections – this is something you will need to do quite often, in order to understand what your object looks like from all directions.



MM



Start by dividing the cube into 3 parts

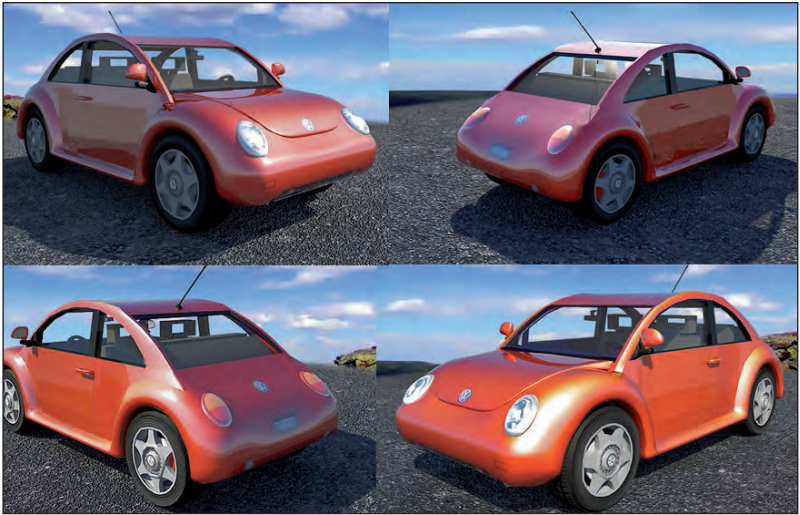


Pointer – If you zoom out too much, to the extent that the object isn't visible, then you can simply select the object from the Outliner and press [F].

We are now going to populate this scene with some more cubes. You can either duplicate the boxes or cubes that you have by pressing [Ctrl] + [D] and placing it wherever you want, or you can create new ones by the same method as before. Once you've placed the cubes, you need to put them in a room, which we now need to create. We can do this by creating a cube much bigger than the rest of the cubes, maybe twenty times larger than the others and place them on the floor - if you duplicate and scale the existing cubes, they will lose contact with the ground and will then be floating over it. To do this, you need to check all four viewports and see if everything aligns properly. Remember to check your scene in the perspective view by rotating, zooming and panning all the time. Since we are covering the modelling section and it's a cube house, let's just model a chair.

Start off by creating a rectangular box by using the polygon cube tool. Select the object and press [Ctrl] + [A] to switch to the Channel Box. In Shapes > Polycube, increase the subdivisions height to 3.

You'll see that the cube has now been divided into three parts. Hold the right-click on the selected object, you'll see options including Edge, Vertex, Faces, Object Mode, UV, Vertex Face and Multi. Make sure you're in the wireframe mode by pressing [4]. Hold the right-click on the object and select EDGE. This will change the object's mode and also the colour of the



wires to EDGE selection where you can select any line that you see on the mesh. Vertex mode is used when you need to modify the dark pink points that you see in the 3D space. When you click or select them they turn yellow, which indicates that they're selected. Face mode is used when you need to play around with the faces of a mesh. These are the three main things that you need most of the time when you are modelling. Let's now move on to the modelling. Once you have made the cube and divided it into three parts, select the vertices and the objects. For an in-depth tutorial, follow the instructions on the video titled Basic Modelling from our DVD.

Create a new scene in a new project. Point to the location where you want your scene to be saved along with the associated files. Next, save the file in the scene's directory and create a box by using the extrude method to make the walls thicker (this is optional, you can either make them thinner or leave it as it is). You can use extrude only with faces without any other mode. It takes four cubes to create the windows for the walls. Next, let some sunlight through the windows. Once they're placed appropriately, delete the history by going to **Edit > Delete by Type > History** - this ensures the objects carry no history.

Click on the huge box, (the walls), and press **Shift + Left Click** on one of the boxes; then go to **Edit Mesh > Boolean > Difference** (make sure you have chosen Polygons from the drop down menubox else this

menu won't show up). You will now see a single window in the wall. You can repeat these steps for the rest of the boxes using the same method four times. Or, you can simply click on the walls, then press **Shift + left-click** the boxes, and press **[G]**. This will repeat the last function used (which was **Edit Mesh > Boolean > Difference**). You can do this for all four of the objects and you have windows on the wall.

3.2 NURBS modelling

All the modelling that we have done up to now has been using polygons. We shall now use NURBS. We will stick to the basic shapes and animation once we are done with the UVMapping and texturing. Always remember you cannot UVMap a NURBS surface, because NURBS are curves. You need to convert the mesh into polygons and then map it. Click in the blank space in the viewport and press **[F]** to centre your whole scene in the viewport.

Now that you have understood Polygons and NURBS modelling, let's set up our camera from where we will be rendering our final scene. There are three types of cameras in Maya.

Camera

You can have free movements, Check **Create > Cameras > Camera** to set its options.



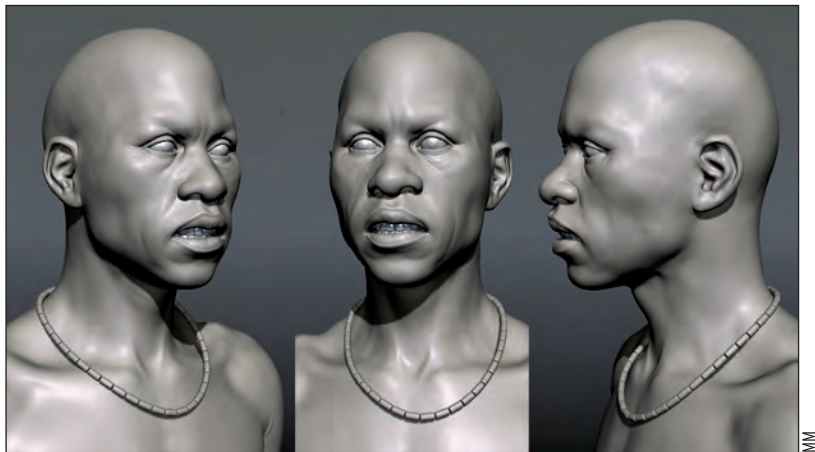
Terminal Reality

Camera and Aim

Is used when you need a certain point as the center of the camera all the time. Check `Create > Cameras > Camera and Aim` to set its options.

Camera, Aim and Up

This one is to specify which end of the camera must face upward. This camera is best for complex animations, such as a camera that travels along a



looping roller coaster. Check `Create > Cameras > Camera, Aim, and Up` to set its options.

Once you create the free hold camera, select the camera and go to `Viewport Panel > Look through Selected`. By clicking this, you will be able to see through the camera. Set where you want your camera to be by zooming out, rotating and panning, and put it in a position. You can change the camera attributes if you want, by clicking the camera and pressing `[Ctrl] + [A]`, which will open the attribute editor. You can play around with it by changing the values in `CameraShape1`, `2` or whichever number your camera shows. For a more practical approach, watch the tutorial videos on this month's DVD.

You can put as many objects as you want in that box since we will be lighting the scene accordingly, rendering it and compositing it finally. Ok, let's take a step ahead by UVMapping our objects and then finding suitable textures for them. **d**

4 UVMapping and Texturing



This step is followed every time a mesh is created and needs a texture wrapped onto it like an overcoat. It's called UVMapping because it takes the U and V coordinates of the mesh and drops it on a flat surface where the user can easily put the texture on it. There are five main types of UV mapping in Maya, namely, Automatic Mapping, Spherical, Cylindrical and Planar.

4.1 Finding the Perfect look for an object

Automatic Mapping

This kind of mapping works well with any kind of objects. Surfaces, Cylinders, Spheres. When you click on this option where the amount of projections you need to put on the object, Maya automatically puts that number of projection around it and places it on a flat surface. Remember this can be the best or could be the worst for certain objects. If certain parts are away from the projection it will give you absurd shapes, which you need to stitch together.

Spherical Mapping

This is used when there is a spherical shape on an object or when there are spheres included in the scene. It becomes easier if you use this mapping where you can see a curvature in an object.

Cylindrical Mapping

Comes in handy when you need to put textures on something that looks cylindrical, like a pipe or poles or anything that is elongated.

Planer Mapping

It's used mainly when there is a flat surface. This works perfectly well on a surface like that.

Identify the shape of the object that you will be UV mapping. Rotate it in 360 degrees and see which of the above mapping processes fits in appropriately.

One can access the UV texture editor as we call it from Windows > UV Texture Editor where you can modify your map so that your texture will look much more accurate.

Before you can start your UV map, change your interface to something that suits this technique. In your Screen Setup toolbox, click on the fifth icon that says Hypershade / Perspective. Hover your mouse over it, to see the name and then click it. You will see the layout changing, on your left hand side is the Hypershade where all the colours, materials and textures go and on your right is the perspective view. Click on the Panels dropdown in the Hypershade window and select Panels > Panel > UV Texture Editor. This will bring the UV Texture Editor in front. If you press [F] in the window you'll fit the whole view inside.

Remember to keep saving your work. Now, Open your `Cube_House` scene and select one of the small cubes. Since it's a cube and not a sphere or a cylinder or even a flat planer, you can do Automatic Mapping on it. Click `Create UVs > Automatic Mapping`. This will put six small colourful and transparent projections around the object. You can change the number from

6 to 8 or 12 by clicking on the small square box beside your Automatic Mapping in `Create UVs > Automatic Mapping` (Small square option box). Once you map it, check the UV texture editor. You'll find that the mapping and sizes have changed and this is where you'll see the UVs laid out on a grid surface. To learn how you can stitch everything together and make it ready for texturing, watch the video titled `Uvmap_Box` on our DVD.

Note

The main aim to use this kind of texture is to check if your UV mapping is correct. You will notice that if any of the squares are stretched or squashed or don't look like squares any more, it only means that your mapping has gone wrong somewhere and you need to edit it again. If you have all squares with same width and height all over the model, then it's a very good UV mapping.

In the video, you'll learn how to:

- Split the window between UV Texture Editor and the Perspective Viewport.
- See the Shaded View by clicking on the blue box icon.
- After selecting the box, go to the Attribute Editor and click on the
- `PolySurfaceShape1` tab and tick the Opposite checkbox. You can now see the difference in the viewport.

Save the file as `Uvmap_box` and press [Enter]. This saves in the scene folder where you had set your project in. Select any box; hold the right-click, which will show you a drop down menu as well. Go to `Assign New Material > Lambert` (We are only putting a texture on Out box to check that our UV Mapping happens accurately) and rename it to `Box_texture`. Click on the small black and white checker box next to colour and select `File` from the window.

Zoom into the box and you can see that the image is wrapped around it. Select the box again and go in the `Box_Texture` tab in the Attribute Editor and click on the small arrow beside colour which previously was a small checker. Once you go inside, you'll notice two tabs `File` and `Place2dTexture1`. Click on `Place2dTexture1`, locate `Repeat UV` and enter a value of 5 or 6 in the box and press [Enter]. You will now see that the squares on the boxes have gone smaller. The math is that the texture has only repeated itself five times, which is why it goes smaller.

In the UV Texture editor, expand the Viewport by hovering your mouse

on it and then lightly pressing the spacebar. Click on the Move UV Shell Tool and move the layout aside so that we can view it properly without any bright colours from the image.

Staying on Polygons mode, click Create UVs > Automatic Mapping. You will now see six projections on all sides of the box.

Go to the object mode by keeping your right-mouse button pressed and selecting it. Take the Move UV Shell Tool and again move it on the grey area to view it properly.

Press [W] to come out of the tool and then keep your right-click pressed and select Edge.

Select an Edge, (when you do that you will see another edge being selected. This is because when you UV map your object, it splits the edges into two or more parts) and click on the Move and sew the selected edges button. This will stitch the two parts together. We do the same to the rest of the edges. You need to look at the model and see which edge you are selecting; else your whole map will turn out to be a small dot.

Once you sew all the edges together, rotate your UV and place it back in the texture. You can then have a look at your box where all the squares have the similar width and height.

You can use this method to UV map all the objects in your scene, including the walls.

4.2 Texturing

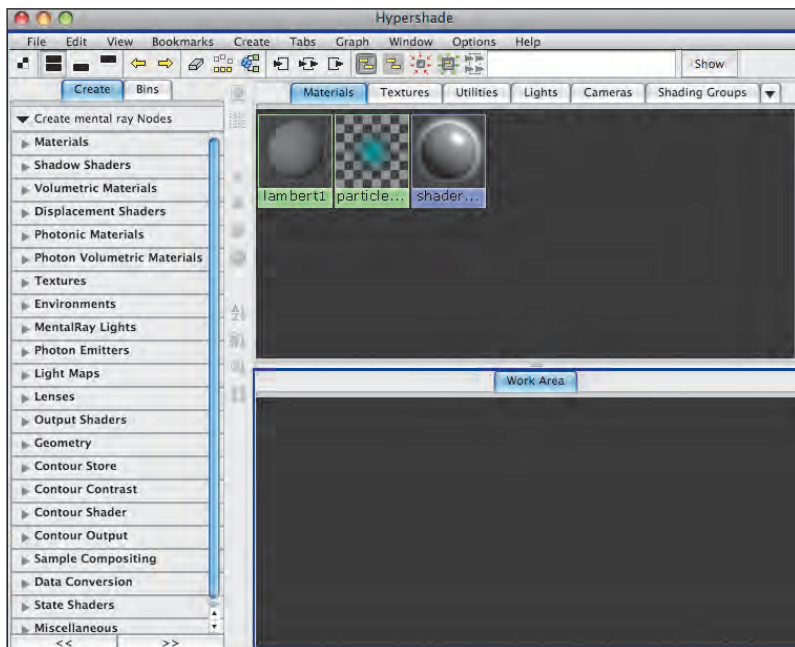
The Hypershade is the central working area of Maya rendering, where you can build shading networks by creating, editing, and connecting rendering nodes such as textures, materials, lights, rendering utilities and special effects.

In this method, the user starts giving the look of the object by giving it a skin. You can find innumerable images or textures online, and many artists go to <http://www.cgtextures.com>.

This method comes right after UV Mapping, because if you don't map your U & V coordinates and if you apply your textures on to it, they will look really weird and unplaced which you wouldn't want. Also keeping in mind that the textures you choose should go with the scene and should look half retro, partly modern, partly futuristic unless that is what you were intending to get.

Most texturing is done from a window called Hypershade, which can be found in Windows > Rendering Editors > Hypershade.

Hypershade



Spend time to understand the detailed menu of Hypershade

Maya's Hypershade is one place where you need to spend considerable amount of time to understand it and master it since it provides an easy way to create, edit, and connect rendering nodes such as textures, materials, lights, rendering utilities, and special effects.

For a detailed look at Hypershade and its functionality, watch the video titled *Hypershade_Overview* on this month's DVD.

Open the last UV mapping file and save it as *Hypershade_Overview.ma*. You can click on the fifth button of the screen set-up to activate Hypershade or you can simply go to *Windows > Rendering Editors > Hypershade*. On the left side you see a Create bar. This is the bar where all the materials lay. You can read the material types as well. On the right-side of the window is the Top and Bottom tabs. The Top tabs, give you information of materials, lights, camera and effects in the scene. Similarly, the Bottom tab is the work area where you drag your nodes, do your mathematical calculations to create

a shader and access the deep values/nodes that are stored in the shading network. The bar on the top of Hypershade is the Menu bar. In the Materials tab, click on the first shader that you see. Instantly, the attribute editor points out the attributes of the shader. Hold the right-button of the mouse on the object and check **Select Object with Materials**. This will show you which 3D objects are using that material. You can try it out with the rest of the shaders as well.

Try and click on every button on top and see how it changes the view within the Hypershade tool. If you have several unnecessary shaders in your scene, go to **Edit > Delete unused Nodes** which will clear out the scene. We shall now see the basics of what each and every material that you see in the create bar does.

Surface Materials

This type of material follows the types of surfaces onto which you can map textures. Properties or attributes such as shine, matte, reflectivity and gloss, vary among the different types of materials in Maya. For example, if the texture requires a shiny surface, such as chrome, use a Phong or a Blinn material rather than something like a Lambert.

Volumetric Materials

This is nothing but a physical appearance of atmosphere like fog or air in space, which is also surrounded with other objects.

Displacement Materials

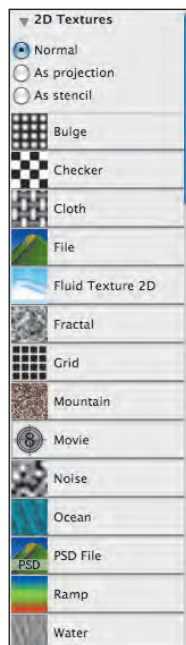
The Displacement lets the user emboss or carve bumps or dents into the surface by assigning images or colours to it.

2D Textures

This kind of material wraps around an object like a wallpaper.

3D Textures

A 3D texture projects itself through a surface, like wood or the texture on the marbles.



2D Textures

Env Textures

A set of materials used to create physical sun and sky.

General Utilities

A set of nodes used to do math operations in the Hypershade.

Colour Utilities

A set of nodes to manipulate the color in the Hypershade. Now that you have a file (`CubeHouse_UVMap.ma`), which has the objects that are UVmapped, let's start with the texturing. We will be using the word 'shader' often. A shader is nothing but a material used to colour or skin a 3D object. For this you would need an image editing software, preferably Photoshop.

From where we last left the scene, follow these steps:

- Save the file as `CubeHouse_Texturing.ma`.
- Remove the UV colorful map from all the objects by clicking on the object and going in their attributes, click on the `Box_Texture` tab (The place where we assigned the `UV.jpg` image previously), right-click on colour and then click on `Break Connection`. This will delete the image that was connected to the shader.
- Drag the Colour bar to increase or decrease the intensity. This will give you an understanding that the particular shader is affecting those objects.
- Once that is done, in the UV Texture Editor Viewport, go to `Image > Create PSD Network`. This will create a shading network where you can define what image you want to put on the UV map and how you want the 3D object to look.
- After clicking the `Create PSD Network` option a small window will pop-up, this is where you need to specify:
 - a. Where would you like to save the PSD network file.
 - b. What resolution is your image supposed to be and
 - c. What all do you need in your shader, eg. colour, bump, diffuse and transparency.

For this example, we shall choose colour and bump. Colour is where the proper image goes and bump is where the black and white image that calculates how much bump or roughness an object should have. Click on create. Maya calculates all the attributes and finally gives out a path where your image has been saved as a PSD file.

Save the file

Open the PSD file in Photoshop. You will notice the same UV layout in the PSD file. Import or copy the file CardboardBox0017_S.jpg from the PSD file.

Place the image in such a way that it covers up the whole layout. Now import the Recycle.jpg image and place somewhere over the cardboard, but inside the layout.

Merge the two layers and drag the layer inside the Box_Texture.color folder. Duplicate the image and drag the new copy under Box_Texture.bump folder. Delete the UVSnapShot along with Layer one and Layer two.

Select the layer which is under Box_texture.bump and desaturate it completely. Save the file and you can apply the same procedure to the walls, tables and chair.

Open Maya and select the boxes that the shader was assigned to. Go to the Textured view by pressing [6], you will see that the texture has been loaded and the boxes now look like they are supposed to.

Now that you have an understanding of how you can assign and create a texture for an object, you can do it for the rest of the objects. For now, we'll assign a simple colour to the rest of the objects in the scene.

To do this, hold the right mouse button and go to Assign New Shader > Lambert. Rename the shader to avoid confusion.

Click on the small grey rectangle beside Color and change it to bright red. Do the same for the rest of the boxes and chairs. We are going to keep it short and simple for the walls. Either apply a colour to it or the plaster texture in your source images folder. **d**

5 Basic Animation

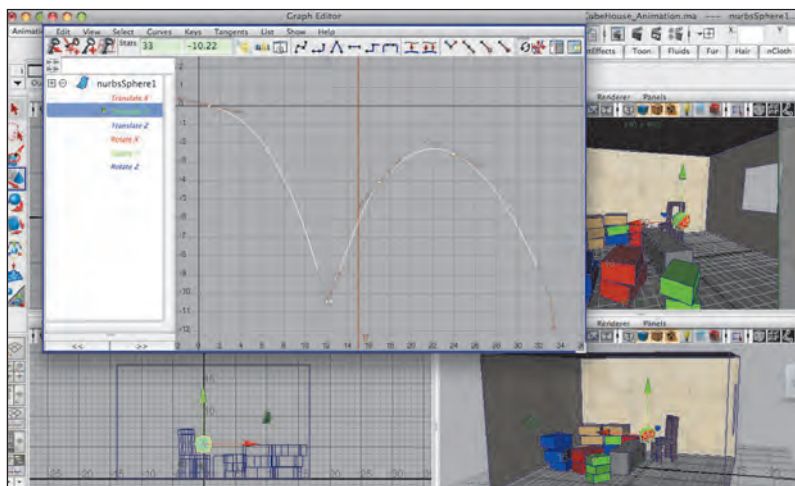


Most animation instructors start off with the age-old bouncing ball animation exercise. It has to move, rotate and deform in a convincing manner. To reach our production goals, we need to follow certain guidelines and practices. Typically, Maya doesn't show all of this in an obvious way for a user to animate, but we can now decode it step-by-step and jump into the animation boots.

Start off by setting your animation preferences by going to Windows > Setting and Preferences > Preferences. You will see a new window pop-up. Navigate to Settings in the Categories section. The two main things in this window are the Working Units (the type of measurements you like to work on, the default is centimetres) and the Time (i.e. what frame rate you want). Let's apply a ramp shader to the ball, so we know which direction

it is rotating in. Since we already have our camera set, go to Viewport > panel > Perspective > Camera1. Now save your scene.

Let's start by figuring how the path of the ball is going to be relative to the camera so that we know when it enters the frame and when it exits. We shall start by having the ball coming from the window, bouncing around and finally hitting the camera. Move the ball around in front of the camera to get an idea how you would like it to move. Press [S] to set keyframe on the frame that you want to animate. However, if you do that then all values will



Change the look of your graph editor's Translate Y curve to something like this

be animated, including translation, rotation and scale. Select the ball and place it outside the window and rotate it to show that it is coming inside the house naturally or rather someone threw it. Clear all transformations on the ball by going to **Modify > Freeze Transformation**.

Animating

Increase the time slider by entering a number somewhere around 44 instead of say 24 on the timeline. Since our ball is going to bounce in the scene. Go in the channel box and lock the X, Y and Z scale for the NURBS sphere or the ball for now, just so we won't have any scaling problems later. Now, select the balls and press [S] while you are on the first frame (this will put a key frame on that particular frame i.e. all the values on that frame remain static.

Go to another frame, say frame 12 and move the ball on or near the ground and set another key frame. What we are doing here is setting up where the ball is going to hit and bounce. Scrub through the time-line to see the ball movements. Once you're satisfied with that, go to another frame and move the ball up in the air again to follow the motion and press [S]. Follow these steps until you are satisfied with the bouncing look. Now that we have set-up the ball animation, refine it by going to Graph Editor located under Windows > Animation Editor > Graph Editor.

The Graph Editor contains tools and operations for manipulating animation curves and keys within the graph view of the Graph Editor.

When you select an object, you will see your object NURBSphere1 on the left side of the editor, along with the animated values of the Translation and Rotation of the X, Y and Z curve. Select Translate Y from the left-hand side and you will see only that line or curve. When you select the curve, it will turn white (the default curve selection colour). Now try and select a single point, you will see a tangent connected to it. Select one of the two handles. Notice that the handle that is selected turns yellow. If you move the handle, you are also changing the animation values. Keep the Graph Editor open on one side and view the ball in one of the viewports.

You will need to select the points, break the tangents and manipulate it accordingly. Follow the videos titled AnimationPart1 and 2 on this month's DVD.

Once you are done with the graph editor, save your file and view the animation. Next, add an animated feel to the ball by adding some rotation and squash effect.

Rotation and squash

Since the ball looks static when it's bouncing, let's give an exaggerated feel to it. The best way to animate is always via the graph editor. Always play your animation to get an idea how it looking and what kind of movements would make it look better.

To rotate the ball, go to the frame where the ball is bouncing on the ground, in our case it's frame 12, zoom in and press [E] or select the rotate tool. Rotate it ever so slightly to get the movement right. Look at references of a bouncing ball to get the desired



look for it). Set a key by pressing [S] on that frame. Now go on the other keyed frame, which is frame 24 and rotate it again. Press [S] when you're satisfied with it. Do the same kind of rotation on every frame where you see the key, keeping in mind that the rotation should be subtle and in the flow. Any absurd rotation can make it look really weird.

Once you are through with the rotation animation, view it by clicking the play button. To start off with the stretch and squash effect, go to the frame where you see the ball lands on the ground, the same frame where we set our keyframe. Left-click and select the ball. Next select animation from the Menu box. In the create deformers dropdown, go to Nonlinear > Squash. This will add a deformer to the ball. A deformer is nothing but a set of attributes that change the formation of the ball and gives you complete control to manipulate its shape. You will see a thin line in the middle of the balls.

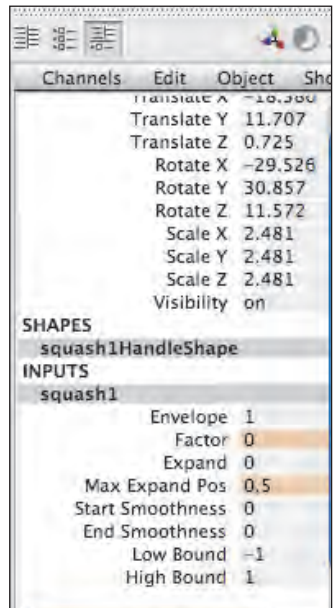
You will see that it has a few options inside, for this illustration we will be using Factor and Max Expand Position.

Factor

Specifies the amount of squashing or stretching. Increasing negative values specify squashing along deformer's local Y-axis. Increasing positive values specify stretching along deformer's local Y-axis. Use the slider to select values from -10.0000 to 10.0000. Default is 0.0000 (no squashing or stretching).

Max Expand Position

Specifies the centre of maximum expansion between the high bound position and the low bound position. Values can be between 0.01000 (near the low bound position) and 0.9900 (near the high bound position). Use the slider to select values from 0.0100 to 0.9900. Default value is 0.5000. Before you can change any of the values, you need to position your deformer in a straight line if it is facing horizontally or diagonally.




Keeping the line selected, go to the channels box and locate something squash1 and click on it

Change the value of coordinates to 0 (Zero). This will get the deformer facing in the correct direction. While the deformer is selected, go to the channel box and change the factor value to 0.4 or even -0.4. You can see how the ball is squashing and stretching. If you scrub through the timeline, you will notice that the deformer stays in its place and if you change the fact value, the ball doesn't deform that well or in some cases it doesn't deform at all. This is when the term "parenting" comes in to picture.

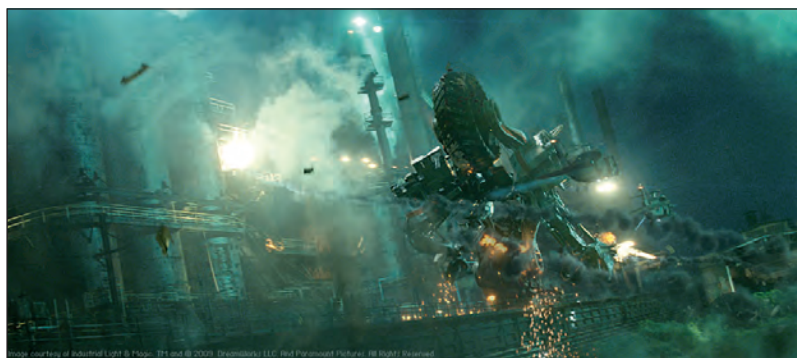
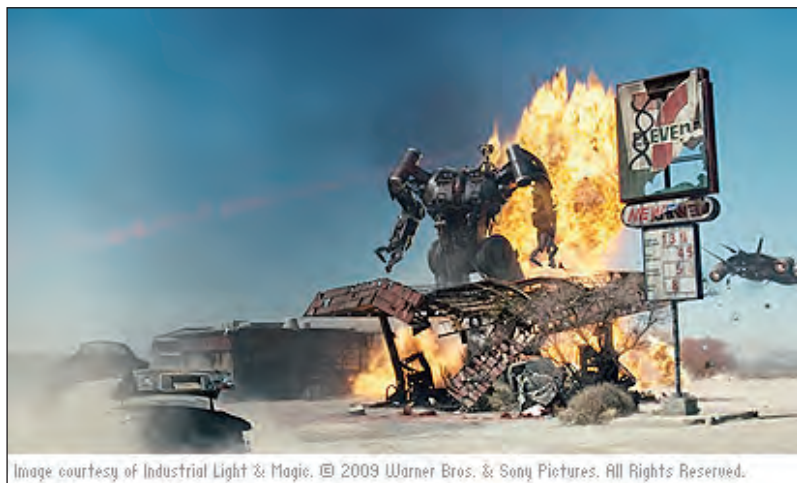
Parenting means when two objects are parented together, it will make a parent and child relationship between the two. In other words, the child object will follow the parent. If two objects are selected in sequence, the first selected object becomes a child of the second selected object. In this case we need to select the line (deformer) first and then the ball. Select the line. Press Shift + left mouse button and click on the ball. Now go to Edit > Parent. This will parent them together.

Once you are done with parenting, start deforming the ball. When the ball comes from outside the window and hits the ground, it should squash a little. So, select the deformer and go to Factor. Change the values where it looks like it's squashed and right-click on the value and select Key Selected from the menu. Go back to the first frame and change the factor's value to 0 and do the same, right-click and set a key there.

Playback frames 1 to 12 and notice how the shape deforms itself. Scrub through it and where you see the ball isn't deforming well, you can change the factor rate and set a key there. You can put set any number of keys as long as it looks good and does not jitter. Repeat the same steps for the rest of the frames to get the result you want. You can also play with Max Expand Position so as to put minor details where necessary. 

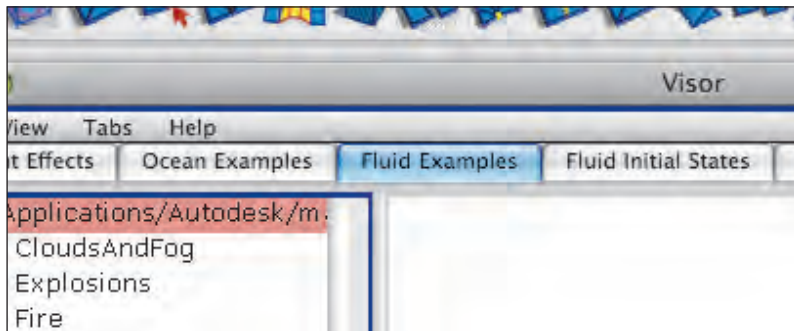
6 Dynamics (Adding fire and smoke)

Dynamics, as the name suggests refers to the physics of stimulating development and forces of natural phenomena. This technique is used in Maya to create effects like Fire, smoke, Earthquakes, glass shatter or anything that has to do with nature and its forces. To access dynamics select Dynamics from the Menubox dropdown.



6.1 Using the elements from the default Library

By default, Maya has a number of effects in its library called Visor. To access Visor, go to `Window > General Editors > Visor`.



Click on it and you will get another bunch of folders on your left side

This window will show you a number of folders, with different Effects and Mesh. For now, since we are focusing on the fire and smoke effects, let's add them then in an empty Maya scene. To add fire, do the following:

- Start a new scene.
- Open Visor and Locate the Tab called `Fluid Examples`.
- Select the folder called "Fire" (This is where you will see a bunch of fire effects).
- Select the `Flame.ma` icon with your middle-mouse button and drag and drop it in your scene.
- Extend the frame range to 100 let the frame buffer for few frames.
- Play the animation and Render a single frame by clicking the `Render the current frame` icon. This is how you can get fire, which is in the Maya library. Similarly, to create smoke, go to `Visor > Fluid Examples > Smoke` and select the smoke you like. Drag and drop it in the scene, play it and check the single frame render. For a better understanding on smoke and fire, watch the video titled `Dynamics_visor` in this month's DVD.

6.2 Creating a custom dynamic element (Fire)

To create custom Fire using Maya, start with an empty scene. Make sure the Dynamics menu in the menubox is active, and then go to `Fluid Effects > Create 3D Container with Emitter`. Select the Emitter (which looks like a small circle inside the container that was just created) and move it closer

to the Grid of the container. Make sure you don't take the emitter outside the container. Increase the timeline to 200 frames. Select the container you just created, and then go to its attributes (make sure you are looking at the fluidShape1 attributes).

For now, we are going to keep the resolution a little low. If your resolution and size is not 10, then input 10 in all the six boxes. Change the Temperature and Fuel to Dynamic Grid from the dropdown menu.

Change your boundary from Y to -Y. Play the animation and see how it looks. Select the container, and under the fluidEmitter1 attributes, change the following options:

Fluid Attributes: Heat/Voxel/Sec = 2.000; Fuel/Voxel/Sec = 4.000

Fluid Emission Turbulence: Turbulence = 1.150.

Go to the fluidShape1 attributes and change the following options:

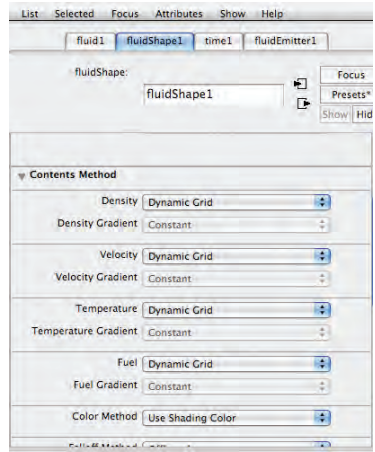
Density: Buoyancy = 9.000;
Dissipation = 0.182

Inside the fluidShape1 attributes, change the following options under the Contents Details section:

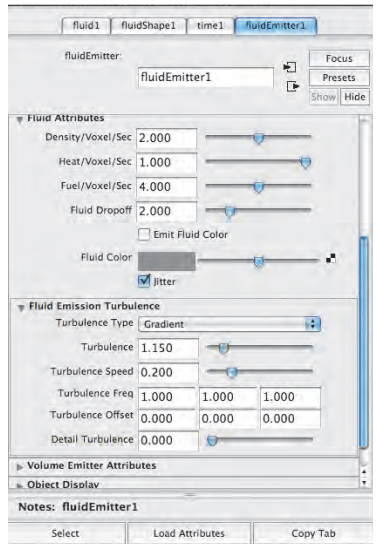
Velocity: Swirl = 10.000

Turbulence: Strength = 0.010

Temperature: Temperature Scale = 1.930; Buoyancy = 9.000



Dynamic Grid



Select the container, and under the `fluidShape1` attributes, change the following options under Contents Details:

Fuel: Fuel Scale = 1.960; Reaction Speed = 0.970

Scroll down to the "Shading" section and change the following options:

Shading: Transparency = White Grey; Dropoff Shape = Sphere; Edge Dropoff = 0.440

Color: Selected color = Black

Scroll down to the "Incandescence" section, and change the graph as shown on the image. Play the animation and stop it in a place where you think it is suitable to render. Render one single frame and you'll see the Fire that you have created from scratch. For more, watch the video titled `Dynamics_Fire` in this month's DVD. **d**



7 Lighting



Lighting, if used effectively, along with UVMaps, camera angles and textures will add life to your scene. In fact, even when your modelling doesn't meet expectations and you don't want to waste time and miss your deadline, you can always use lighting so that your models and textures look really pleasing.

Sometimes fog appears like an inverted cone. The only difference between people who light on sets of a movie, television or a commercial is that they light the scene in the real world using spot lights, bulbs, bounce, diffusions, reflectors and overheads, whereas a 3D lighting artist does it in a 3D world with 3D lights and a set of attributes that are in one single software.

For a 3D lighting artist, being aware of the different lighting conditions is very important. To understand how the 3D lighting works, it's important to play around with the lights and get familiar with the term, and lighting itself. In Maya, if you don't have any lights in your scene, it will be rendered as a complete black image.

The types of lights that Maya has are Ambient, Directional, Point, Spot, Area and Volume light.

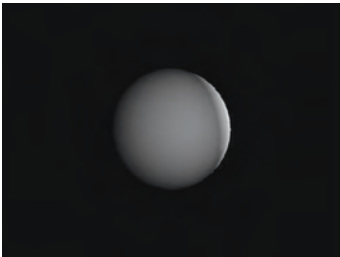
If you don't add lights to a given scene, the entire scene and objects will be rendered as a black frame (as in Maya). In other programs (such as 3DS Max), there is default lighting in a scene that is replaced as soon as you start adding lights. Depending on how you add lights to the scene will determine the effect.

Lighting guidelines

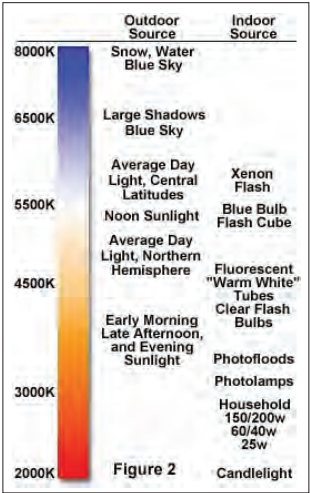
- The type of lighting you would use for your scene would depend on things like



In a scene during the night, notice the street light, you can see dust floating in the air



RimLight separates an object from the background



If a colour is a hot, it should come from a hot source such as a candle or sun. Similarly, cold colours from the sky, water or snow

weather condition, time of the day (if it's daylight, nightlight, dusky, dawn, sunny). Tip: There is always only one light source – The sun or the moon, unless there are lamps, streetlights, car lights, house lights involved.

- At times when your textures are lit, it won't give the desired effect unless you tweak your colours on your objects.
- Make sure you don't have any dark areas or places where light doesn't follow.

To fake lights in the 3D worlds, visual effects artists use terms such as Key Light, Fill Light and Rim Light.

Keylight

This type of lighting creates the main lights in the scene to light up the model and defines its most visible part. The sun or lamps can be considered as key lights.

Fill light

This is a soft light that extends the keylights horizons in real world. The sky can be considered as fill light.

Rim Lights

This creates a bright portion on an object to visually separate the object from the background.

Colour

Colour forms one of the most important factors in Lighting. Light is usually white in colour, but when white light bounces on leaves or the ground or even on walls, our surrounding seem to have a lot many colours. Colours will always be either of Red, Green and Blue. The colour temperature chart has a bar with colours from Red to Blue. Let's see the different types of lights in Maya.

Ambient Light

This refers to the illumination surrounding an object or scene. We put ambient light in a scene to give an overall ambient feel to it. The ambient light adds diffuse light to the scene.

Directional Lights

Lights that travel in a parallel are called directional lights, and also travel the

furthest. The direction of the light is defined by the light's orientation. These types of lights are parallel to us because the source is at an infinite distance from us. In Maya, only the direction of the light source matters and not the position. The best example of this light is the Sun.

Point Lights

Light coming out from a single source and going in all directions is termed as point light. This light fades off after a certain distance. A light bulb is a good example.

Spot Light

A spotlight shoots light rays from one single point. This type of light has both position and direction, which you can manipulate as and when you want. The light fades off as the object goes further away from it. Since the spotlight itself is a cone, it emits light and falls on an object, with the illuminated area forming a cone.

Area Light

The angles formed with the area light and the point that is shaded determine the illumination. As the point moves further away from the area light, the angle decreases and illumination decreases, much like decay.

Volume Light

Volume light is similar to a point light, only difference is you can define the spread by simply scaling it, also it's a soft light that you can use in your scene to give a nice smooth look.

Open the animation scene and save it as `CubeHouse_Lighting.ma`. Take the Cube house on one side, just so when we put some lights in the shot, and enable shadows it won't affect the rest of the objects and we will be able to see clearly. Put a plane under all the objects.

Locate the black button on the Status line. When you hover your mouse over it, it says render the current frame, which means it will render the frame you are on in an image format. A Renderer takes the 3D data from your scene and renders it out from a camera as an image file. When you hit that button, you'll see your scene being converted into an image without lines and the grid around it.

Except for the colour, you can manipulate the output in the render settings window. In the render setting, on the top of the window, there is

something called as Render Using Maya Software and a drop down menu that also includes Maya Hardware renderer. Maya has another renderer called Mental Ray. If it's not there in your drop down, then go to Windows > Setting / Preferences > Plug-in manager and locate a file called Matatomi.mll. Click on Load and you'll see the mental ray in the "Render Using" dropdown Menubox. Let's make one change here before we go ahead with lighting.

Open the Render settings, and go to the Common tab. Scroll down to the bottom and open the Render option menu. Uncheck the Enable Default Lights button and close the window. This will take all the lights that were lighting the scene by default. If you render a single frame now by clicking on the black button, you will notice that the whole render has gone black, but, if you click on the white button that says Display Alpha Channel beside the RGB channel button, you'll notice that the shot does have an alpha channel to it, but only because there is no sign of light in the scene, it looks black.

Now that we know what rendering is, let's add a directional light in the shot. To do this, go to Create > Lights > Directional Light. Directional light doesn't depend on the position or scaling, but on rotating, place the light in an angle you'd prefer, and render the image. You will be able to see some light that is hitting the object. Naturally, you won't be able to see the light source. You can rotate the directional light in all 360 degrees and see how it's affecting the objects.

With the Directional light selected, go to the Attribute Editor and look at the first option that says Type. This is also a place where you can specify which light you would like to use from the drop down box. The default here is white, but sometimes when there is some blue light or an orange light from the sky.

Next is the intensity slider. The default value is 1, but in case there is a stronger source of light, then it is suggested to tweak it accordingly. Decay Rate Specific to Spot, Area, and Point lights, this attribute determines the rate at which the light intensity fades (decreases) at a distance.

The next thing we tweak is the shadows. Click on the small arrow beside shadows, which will open up the menu and show a bunch of attributes attached to it. You can click the checkbox, which says "Use Depth Map Shadows". This will enable normal shadows. Hit the current render button and see how it looks. Shadows will appear in the render that you just did. If you zoom in a little bit more, you will notice that the shadows are tearing

slightly. This is when you go to the next option, which says Resolution. You can increase it to 1024 to get a smoother edge. The more you increase, the better your shadow is going to be. Filter size and bias are the options used to make the edge of the depth map shadows smoother. You can compare the images by saving the before and after.

Raytraced shadows produce very good results in most situations and the edges that look sharper in the depth map shadows will look smoother in raytrace. You can play with the three controls (Light Angle, Shadow rays and Ray depth Limit) to get the desired look for the shadow. You can select a region and tweak the values there to save render time. You can also delete the Directional light.

Let's put an ambient light in the scene and see how it looks. To do this, go to **Create > Lights > Ambient light**. The difference between the attributes of the Directional light and Ambient light is that the Ambient light has an additional value slider called Ambient shade and it has no depth map shadows. In the ambient shade slider, if you change the value to 1, there will be light only in one direction. Similarly, if you set it at zero, it will come from a single source. The default value here is 0.45. The position of light is important.

Using the point light can be very effective in many ways, since it's a source of light that glows from a single point and in 3D if you are doing interior lighting, and then the use of a point increases.

The position of the light matters here. The Spot light looks like an inverted cone and also works like a cone. The light doesn't penetrate through the cone but it surely illuminates its exterior. Similarly, a container called cone manipulates the light. Let's have a look at the attributes of this cone, which are different from that of any other light.

Cone Angle

This is where you can specify how big the radius of your cone is going to be. For example, if you have a scene in which you need to light up a character that is singing on the stage, you will need to put a spot light around it and not all over the stage.

Penumbra Angle

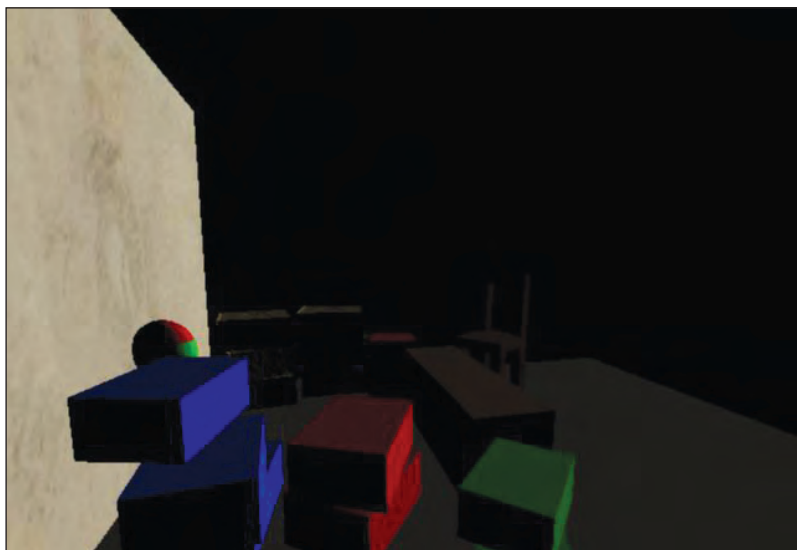
You can change the smoothness of the radius and make it soft on the edges. Render out an image with the value 0 and 4, you will see the difference that it makes.

Dropoff

An option to change the smoothness of the light from the source itself.

Light Fog

The fog that is produced when light hits the ground. Sometimes it's also used as god rays. You can click on the small arrow icon beside the name, to change the colour of the fog. In short, you have complete control over what you are



Your render will look a little flat and dull

doing when you are lighting. This comes in handy when you are lighting up a scene where you have streetlights, or light coming from a window, or even a cars headlights.

Fog Spread and Fog Intensity are additional attributes to make the fog thicker, denser and smoother.

This light has the same shadow attributes as the Directional Light. The position, scale and rotation is important.

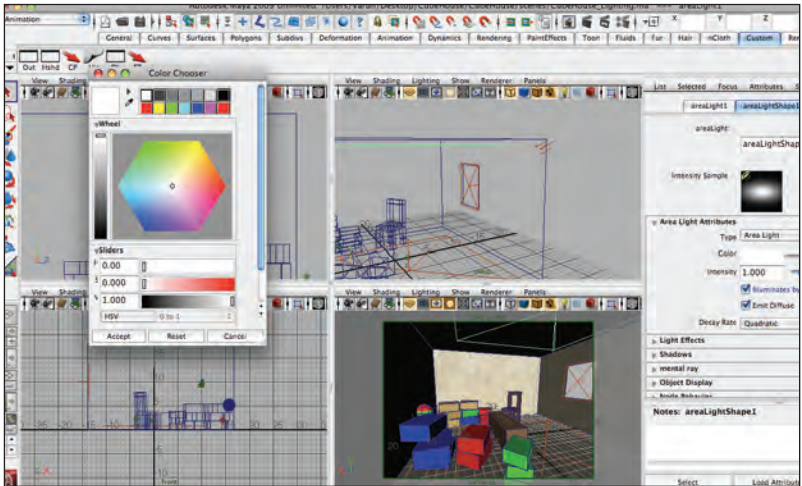
The area light is a 2D rectangular light source. A large area emits more light, and therefore, also the distance to the objects matters. The position, scale and rotation are important.

Let's start with the scene lighting now that we understand what lights are

and what type of light are suitable to light scenes. Open the `CubeHouse_Animation.ma` file and save it as `CubeHouse_Lighting.ma`. This way, we'll have a safe copy of the animation file. We need to add some sunshine to the scene. Start by creating a directional light outside the house and point it in a direction where it looks like the light is coming from the window. You can also do that by selecting the light, clicking on **Panel** in the viewport and selecting **Look through Selected**. This will enable you to look through the light and adjust the direction where it should shoot at.

Once you are satisfied with the position, choose the camera viewport and render the current frame. Make sure that in the Render stats of the House mesh, "Opposite" is switched off and "double sided" is turned on.

Open the Attribute Editor and select that directional light. Click on the directional **LightShape1** tab and see the number of preferences to change the light and conditions on it. Increase the intensity to 5 and check the single frame render. You will see that the light has become stronger, but it still looks dull because it needs shadows. Expand the shadow option from the attributes and check the use depth map shadows. Render and see the difference, and you'll notice now the whole image seems black except for the light that is coming from the window. However, it still looks very rigid. This is when you need to play around with the settings and get the desired



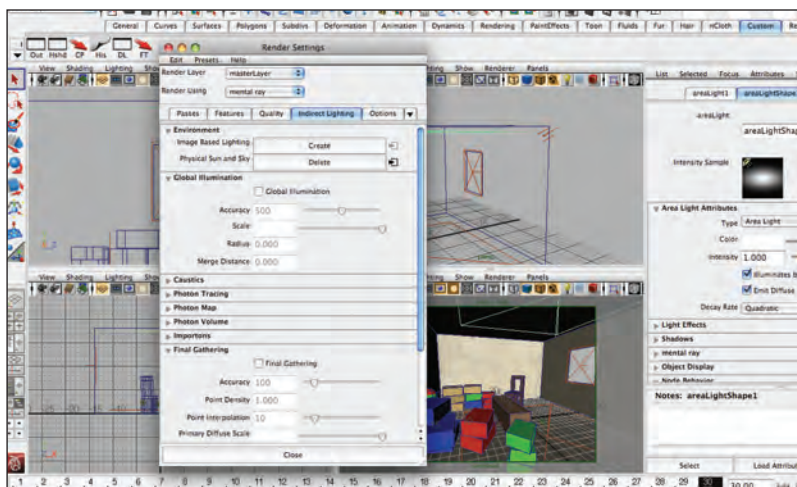
You can change the ground colour by clicking on the colour rectangle in the light clicking on the "picker tool" and selecting colour, or by simply choosing a colour from the colour wheel

result. You can change your renderer to mental ray and see the difference as well. For this shot, we tested Maya and mental ray renderer and were satisfied with the mental image. Try switching on the raytrace shadows and increase the Light Angle and Shadow Rays amount to 4 and 64 respectively. Let the Ray Depth Limit be 1. Render out the image and see the difference it makes.

Now that we have shadows and light coming from the Sun, the whole room still looks dark and the shot doesn't look too pleasing to the eye. We need to light up the interiors as well. We are going to change the light or add lights according to the angle of light and its bounciness. If you think of how the light is travelling in this shot, you will be able to notice it comes from the window, hits the corner of the walls and illuminates the whole room. But the objects are still visible.

Create an area light and face it towards the ground. If you render this frame it is going to blow white colour all over the place and over expose the light quite a lot. To change this behaviour, go through the light attributes, change the Decay Rate to Quadratic and render the frame from the camera view again. You can see the change now. Make sure you uncheck the Emit Specular checkbox, which will get rid of any extra calculations and will not look for any shiny materials since they don't have any.

Since we have nothing outside the window, we can either create a polygon



The small arrow box beside the next button will get activated when you click Create

plane and assign a texture to it or we can create the Maya physical sun and sky. For this exercise, we will create the physical sun and sky since it's quite convenient.

With mental ray selected as your renderer, go to the indirect lighting tab. In the environment drop down, you will see Physical Sun and Sky, next to it will be a button saying Create. Click on it and you will see that the attribute editor showing its properties. We will change only one thing in this. Inside the B Unit Conversion, change the value to 0.000050.

Render the camera view and see how it looks like. It will take some time to calculate since the final gathering is on. Final gathering is a technique for estimating global illumination for a given point by either sampling a number of directions in the hemisphere over that point. You can always save the final gather rendered image, save it and do your lighting according to it. To turn it off, go to Indirect Lighting and scroll down to the Final Gathering drop down and uncheck the Final Gathering option. Render and see the difference without the final gather.

Although, we still need to delete the extra sun that was created by Maya Physical Sun and Sky. Open your outliner and delete the sunDirection light from it. This is when you will be able to see your sun coming from the window and hitting the walls, at the same time the light bounces on the ceiling and it pours out a little light.

What we did for the ceiling, needs to be done to the ground as well. Instead of creating a new light, we can just duplicate and rotate the ceiling light and adjust it in such a way that it sleeps on the ground. The lights are not affecting the top and the bottom. It is advisable to pick a colour from the shot where the light is emitting. Always render your image to see the changes that you have made. The new area lights aren't causing any shadows since they are just fill lights that fill up the scene.

For a bounce light, create a point light and drag it to a position where the sunlight is hitting the walls. Place it a little above the ground and the walls.


Open the attribute editor while the point light is selected and change the Decay rate to Linear. Render and check how much it is affecting the scene. You will see that it's affecting the walls and pouring unnecessary light on it, which we can exclude by using the Relationship Editor. You can use the Relationship Editor to edit relationships between objects in Maya. These relationships include Sets, Deformer Sets, Character Sets, Partitions, Display Layers, Render Layers, Render Pass Sets, Animation Layers, Dynamic Relationships, Light Linking (Light-centric and Object-centric), UV Linking

(Texture-centric, UV-centric, Paint Effects/UV, Hair/UV, and Fur/UV) and Hair/Fur Linking.

To remove the House from getting affected by the point light, follow these steps, select the house go to the Outliner, you will scroll till you find a polygon highlighted, double-click it and type CubeHouse_Mesh, so you know which object to choose from when you are changing the relationships. (Tip. It is always better to name all your objects, since it becomes easier for you to find all your lights and objects easily.

Go to Windows > Relationship Editors > Light Linking > Light Centric. The difference between Light and Object Centric is that, Light Centric would show you which light affects what object and Object centric means which particular Object is receiving light from the list of lights in the scene). On the left side of the editor, are the lights and on the right side are the objects. If you select any light, the objects will get highlighted, the ones that are not are not being affected by that particular light.

Select the point light from the left side and find where the CubeHouse_mesh is. You will find it being highlighted. Click on it to deselect it and close the dialog box. This way the house does not get any lights. Render and check the shot. Since the point light acts like a bounce light, let us add ray trace shadows to it. Increase the Light Radius to 4 and Shadow Rays to 1. The shot looks quite decent now; all that is missing is the window glow. If you notice in the real world, when light comes from a window the surrounding areas of the wall get illuminated as well. To achieve that effect, let's put an area light around the window that covers the whole area. This time the intensity of this light would be 0.2 and Decay Rate would be quadratic. We don't need any shadows since it's facing outside.

You can now render this scene and if you think there needs to be some more lights or needs some colors or additional textures. Before doing a final render, let us first understand Layering, which is quite important in Maya when you are rendering for big projects. Follow Video Lighting 1, 2 and 3 on this month's DVD. 

8 Rendering



Rendering or 3D Rendering is the process of producing a three – dimensional image which is made in a 3D software. The rendering process is very similar to cinematography or real lighting in TV or films where you have to add lights, reflectors and produce imagery of high quality and realism. Although in 3D, everything is created from scratch, textured, lighted and finally rendered, this third dimensional data can be any geometry that is in the scene.

Rendering sometimes takes a lot of time depending on the computer(s) and processors, the scene size, the amount of geometry and props in the scene. Rendering an animated movie like *Shrek* or *Wall-e* can takes ages. Passes are used to render out different attributes of your scene separately in a separate image. Some of the passes are mentioned below. (Passes in lay man's language means a set of image sequences rendered out part by part from a scene.)

Beauty Pass

It is sometimes also called as diffuse pass or colour pass which is the main pass and has all the lighting information except for reflection, highlights and shadows

Highlight Pass

They are also referred to as specular pass at times. This pass shows the brightest parts of the image.

Reflection Pass

This pass shows the reflections of the surrounding objects.

Shadow Pass

This pass shows the location of the shadow in the scene.

Effects Passes

These passes include all the smoke, fire, wisps, glows, lens flares etc effects.

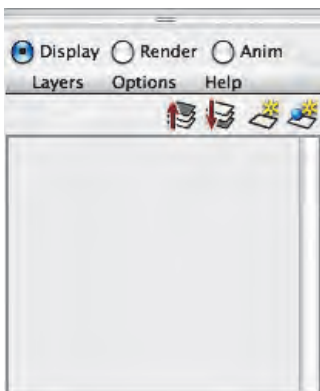
A Depth Pass

Also called as Z-Depth stored the Z information in the file that can be used for putting a depth in a flat image.

Render layers is a very powerful feature in Maya. Let's say you have worked on your work really well with all lighting effects, smoke effects flying everywhere, really nice water simulation and overall the shot is looking fantastic. You used all your energy and stayed up for 2-3 weeks to finish your shot and probably another 4-5 hours to render your scene. When the director comes in and looks at the shot, he compliments you on the great work, but he needs some changes in the smoke, water and some buildings in the centre.

This is going to take a lot of time, energy and effort. Instead, if you have the objects in layers, all you need to do is render them out in separate layers. This way you will have complete control over them and you can do the minor tweaks and render that particular layer which will take probably 1/10th of the time.

This way, when the director asks you to make some changes, you can do that in less than an hour and show him a new version.



You can find the layers under the channel box window

8.1 Using layers and passes

In earlier versions of Maya, the Render layers and Passes were considered the

same. Now in Maya 2009, the controls have become abundant. Looking at your Layer panel you will notice three buttons Display, Render and Anim.

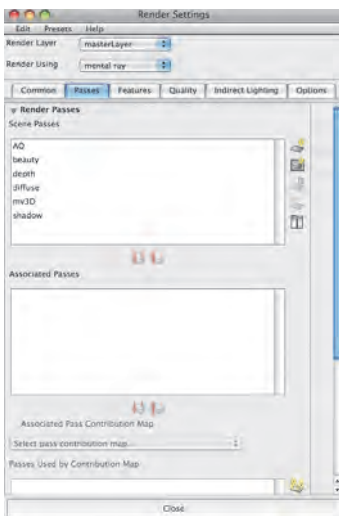
Display is used only if you want to hide some specified object temporarily, or lock the object just so you don't make any changes to it by mistake. Click the Display button and click on the icon that has a white rectangle with a little yellow asterisk on it. You will find a new layer 1 has been created. You can open the outliner and select a bunch of objects. Right-click on layer 1 and say Add Selected Objects. Inside the layer one the V means Visible in the shot. If you click that box again, you will notice that the V goes away and so does the object goes invisible. You can also double-click on the "layer 1" name, and rename it.

The next button is similar to the New layer, but has a small ball next to it is the "Create a new layer and assign selected objects to it" which means, if you have some objects selected and if you click this button; automatically a new layer will be created along with the selected objects in the layer. The first two buttons in the row are nothing but to order the selected layer up or down.

Render Passes

Render Passes are the different things the Render Engine must calculate to give you the final image. In each 'pass' the engine calculates different interactions between objects. Using the Render Layer Editor, one can manage, create and delete layer, add layer overrides. You can also create a render pass from this render layers. Each RenderPass puts out an image or a map.

It can be either Diffuse, shadow, ambient Occlusion, or beauty Depth. RenderPasses that produce images can be directly viewed clicking the render frame icon, or, if they are in a sequence, they will be saved in a location on the computer; specified by the user. Unlike other versions of Maya, we do not have to rely on render layers to generate render Passes in Maya 2009. One can render out all the passes in Maya by choosing mental ray as your renderer. Let us now see how to set up these layers and passes.



The associated passes are connected to the layer that is selected in the "Render Layer"



Open the render settings dialog box and clicking on the 'Passes' tab. The window is divided into two categories, Scene Passes and Associated Passes. Scene passes is where you need to create all your passes. The passes depend on what you specifically need in your shot, you don't need to render out each and every single pass that exists in the menu; which will in turn take space on your hard drive and take a considerable amount to render.

Hold [Ctrl] key and select Beauty, Shadow, Depth and Ambient Occlusion. Hit create and close. So now, we have these different passes that are available to us. But if we render the shot out, we will not get the passes since they are not associated with a particular pass. In this case, we can create the passes that we



just made on a per layer basis. Select all the passes that we created in the render settings and click the icon with down arrow that will get them in the Associated passes box.

We need to render this as a batch image to see the different passes. To do this, change your option in the MenuBox to Rendering, and go to Render > Batch Render. This will render out one single frame (In the render setting, we did not change the single frame to multiple frames) of each pass in the /CubeHouse/CubeHouse/images folder. After rendering, you can open the image in Maya's default fcheck and get the clip finalised. **d**

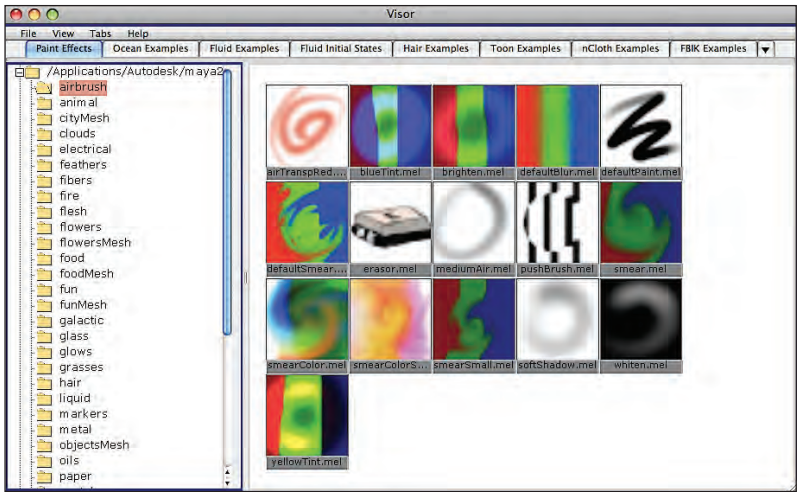


9 Additional Features



9.1 Visor

A Visor is a window or a toolbox where you can find a set of objects and effects. It acts like a Maya library. The only difference is that the visor has objects ranging from smoke elements, flesh, hair to fur. To use any of these tools, click on one of them and draw in one of the views, or simply click the middle button of the mouse and drag in the viewport.



Using Visor will help you with newer textures

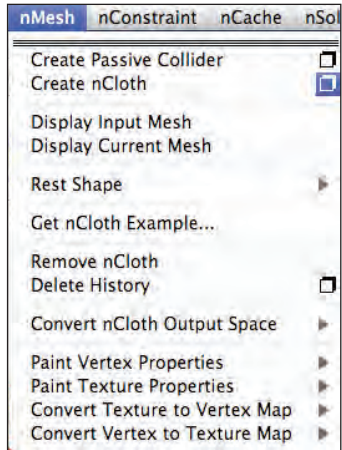
9.2 nCloth

nCloth is a fast and stable dynamic cloth solution that uses a system of linked particles to simulate a wide variety of dynamic polygon surfaces such as fabric clothing, inflating balloons, shattering surfaces, and deformable objects. nCloth is generated from modelled polygon meshes. You can model any type of polygon mesh and make it an nCloth object, which is ideal for achieving specific poses and maintaining directorial control.

In this section we shall create a flag and a tablecloth. For ncloth to have the correct behavior, it needs to interact with the object in a natural form. Maya converts a Polygon mesh into a cloth and with extra set of attributes attached, it becomes easier for us to add realism to it.

Follow these steps to create an nCloth:

Open Scene ncloth_Table.ma from the DVD. We have provided you with



Select the options you need in nCloth

a simple polygon table along with a very basic polygon mesh. Select the checkered cloth above the table. Switch to nDynamics in your MenuBox.

Go to nMesh > ncloth (dialog box). Click on Local Space output and hit Create Cloth. Extend your timeline to 100 and play the animation. You will notice that the cloth penetrates through the table, which is something you don't want. You want it to settle on the table in a wrapped form. To dump the cloth on the table, select the table and go to nMesh > Create Passive Collider. Once you play this animation, you will see the mesh gets wrapped around the table like a cloth.

Change the accuracy of the cloth in the attribute editor and change the number of options you have. Try and move all sliders one after the other and check how it is affecting it.

If you are satisfied with the cloth settling and you don't need it to drop from the top, but be settled on the table from frame 1, then play the animation and stop at a frame where it settles down on the table. Go to nSolver > Initial State > Set From Current. This will get the cloth to settle down from the first frame itself.

In this second part of creating the flag and pole, we will also see how to use point constraints to get the effect. To create a flag, open the file ncloth_Flag.ma from the DVD. To create the cloth, go to nMesh > Create Cloth. Create the pole as a passive collider. Select all the vertices that are close to the pole by going in the vertex mode.

Press Shift + select the pole then go to nConstraint > Point to Surface. You will now see that the points are now connected to the pole and if you play the animation timeline, you can see the flag movement. Although, we want only two points that need to be connected to it. Select the small dotted lines that connects the pole and the flag.

Go to nConstraint > Select Members. Now select the flag and go to its vertex mode. Select the same points that you select to constrain the flag to the pole except for the first and last one. Then go to nConstraint > Remove Members. Play the animation. If you dislike the rigidity and want to add some more dynamics to it, you can select the flag and go to



Your flag will be ready in a jiffy

the attribute editor and change its “Life” and “Drag” values. You can also add more wind effect by changing the wind values.

9.3.1 Fur

Maya Fur is a component of Maya Unlimited that you use to create realistic, self-shadowing fur and short hair on multi-surface NURBS, polygonal and subdivision surface models. You can set fur attributes, such as colour, width, length, baldness, opacity, scraggle, curl, and direction globally, or map them on a local basis.

To add realism to fur, prepare a scene. But select areas or but select the whole model attach fur. Manipulate the fur attributes. If there is animation in the scene (a scenario where a 3D woman is running and her hair is moving with the wind), animate the movements and attributes. Set up a shading Fur effect, or you can choose from the presets that are there within Maya. Rendering the scene. Refining the render settings and rendering again.

Preparing the scene

Since you need to render the fur in the end, make sure your render settings are set-up properly. You can put fur on all surfaces: NURBS, polygons and subdivision surfaces. To put fur on a polygon surface, you need to set the UV's correctly. Mostly, if you use a NURBS or a sub-division surface, they are converted to polygons to give it a better result.

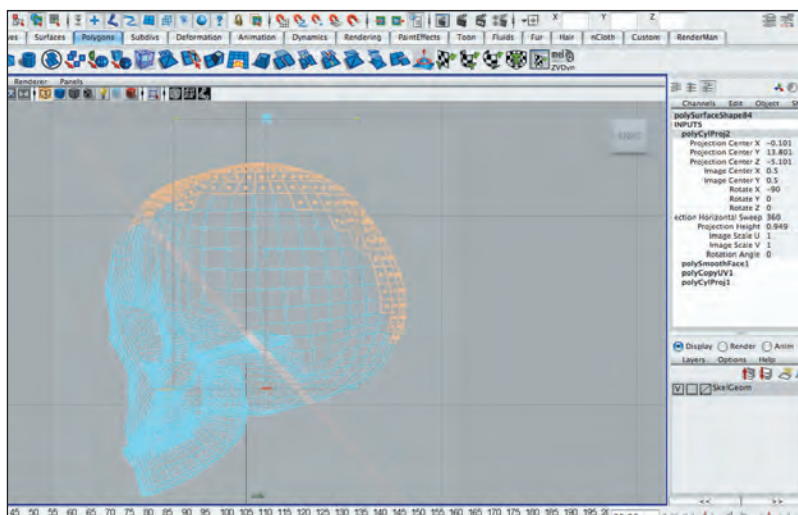
Properties of Fur

A Trimmed surface takes longer to render because of the additional maps and textures attached to it.

The lights in the scene are default, you need to first uncheck the default lights in the render settings and then you can modify the lighting in your scene according to the fur effects you want. For example, to get a good shading effect for the fur, you can add some really good Rim lights or Bounce lights. It's always good to reference your models, since a lot of people in studios work on the same shot simultaneously.

To create fur on an object and see how it looks, import the file maya.fur.ma from the DVD. The file contains a 3D modelled skull. Go in the face mode by right-clicking on the object and select the faces where you want your fur to be attached. You can select the faces from one of the orthographic views. Once done, create a cylindrical UV map by selecting polygons from the MenuBox (go to Create UVs > Cylindrical Mapping).

On the Menu bar, click on Select, and go to Convert Selection > To UV's. Open the UV texture Editor. Go to Polygons > Copy UV's to UV set > Copy into new UV set (small dialog box) and name the set as skull_fur and hit Apply and Close. Now from the MenuBox drop down, select Rendering and locate the FUR menu. Go to Windows > Settings / Preferences > Plug-in manager, scroll down and you will be able to see fur.mll in Windows and fur.bundle on a Mac. Load this file, refresh the window and close it. Go back to the object mode and select the head and select fur > attach fur description > New. This will attach a new fur description node to the skull mesh.



Rotate the cylindrical map to -90 degrees in the X-axis

We need to edit the fur description nodes attributes to the desired values to make the hair style. You can start with a preset from the fur description node to make hair styles. It is the easiest way to start.

Modifying fur attributes

You can modify fur description attributes so that all surfaces with the fur description attached have the new attributes. You can also style a fur description such as shorten or lengthen the fur on some parts of the model by mapping attribute values, or by painting fur attribute values directly on

the model using Maya Artisan. When you apply fur attribute value maps or paint fur attribute values, the global fur description attributes do not change.

Animating fur attributes

You can keyframe the changes you make to fur attributes, and thus animate effects such as growing fur or changing fur colour.

Adding movement to fur

If you are animating your scenes, you can add movement to fur for a more natural effect. Using attractors, you can manually keyframe fur movement, or use Maya Dynamics, you can make the fur react to forces (for example, wind and gravity) or have fur react to the movement of the surface the fur is attached to (for example, a shaking dog).

Setting up shading effects

To create more realistic looking fur, you can create fur shading and shadowing effects. Do this by adding fur light attributes to the lights in your scene.

Rendering the scene

To see the fur effects on your models, you must render the scene. By default, the renderer composites the rendered fur with the rendered models, distributing the fur evenly across each surface (even where the parameterisation is uneven, for example, at the poles of a sphere).

Refining settings

After rendering your scene, you may have to adjust the lighting and fur attributes to achieve the effect you want. Re-render after making changes.

9.3.2 Hair

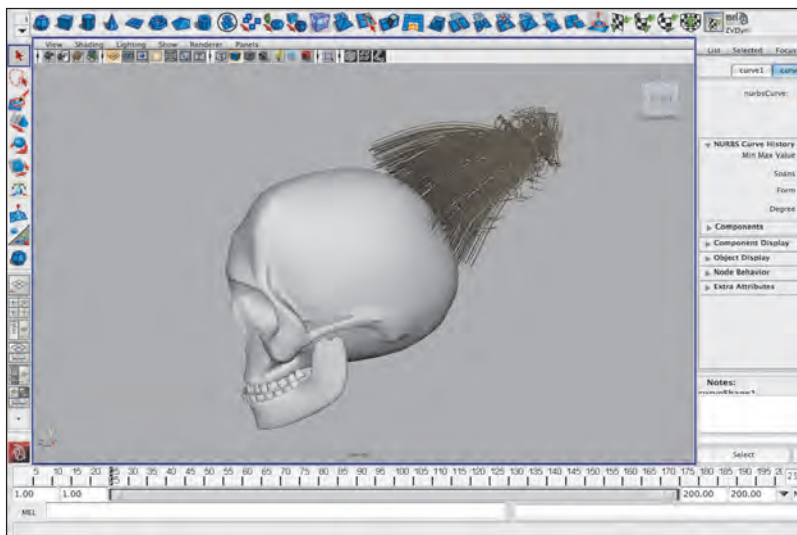
We create hair by the use of splines ripped off a NURBS surface, which is the best way to create and give it a neat style. At the same time, remembering that the hair system is a little tedious and can take some time to understand the basic functionality itself. Once the style has been set, it can be used for various animation purpose.

We shall do the styling on the skull itself. First we need to define the area for where the hair is going to be. The best way to do that is by drawing curves. To create curves go to the menu-bar options. Go to `create > EP Curve tool`. Create a small curve and press [Enter]. Repeat as many times as you

need. Once you create the curves, select them individually in a circular form and loft them (you can loft by selecting Surfaces in the MenuBox and clicking on Surface > Loft).

After doing that, you will notice that the curves have made a surface. Let's go ahead in the outliner and hide all the curves. If you need to keep your scene clean, you can always delete them. Select the mesh in isoparms mode (right click on the surface and click isoparms). Select all the isoparms and go to EditCurves > Duplicate Surface Curves.

We're ready to assign hair to it. This method is a round about way to do it. If we select a curve and assign the "hair system" to it we won't get any result out of it because we need the hair follicle which connects only to objects. For that purpose we need to create a Sphere (which is our dummy object) and assign a new hair follicle to it. Select the Sphere, and click on dynamics from the MenuBox and go to Hair > Create Hair. This will add some hair



Creating hair is easy with Maya

on the sphere. Now that we have the hair follicle, we'll connect them to the skull's head and see what we get.

We use this to transfer the hair system to our curves. Select all the curves that you previously made and go to Hair > Assign Hair System > hairSystemShape1.

We can now delete the sphere, but to do that, go to **Hair > Paint Hair Tool** Option and change the painting mode to **Delete Follicles**. Now paint over any hair follicle you don't need. After deleting the unnecessary one, delete the sphere as well.

Play the animation or render a frame and you will see the hair movement. If there isn't any, then you can always add forces wind to it.

9.4 Rigging

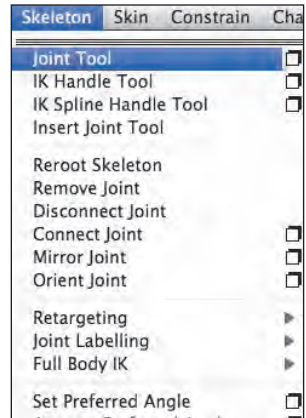
Rigging is a method of attaching bones or biped to a 3D modelled character or object in order to make them animate. By attaching bones or creating bipeds, the 'character' can walk and make bodily movements. Joints is the tool that creates these bones.

Create joints by going to **Skeleton > Joint tool**.

While creating joints, do not use the perspective view, but only do it via any of the orthographic views. Always position the joints inside the mesh to get better control. When you are done with adding joints in your mesh or object, hit the enter key and you will be done for that bone.

While adding a bones, remember the bones are not visible when you render a Maya scene file. The main structure of the of the geometry should be ready, along with the UV mapping to avoid any bends in the mesh before adding the joints. A skeleton can have as many bones as you wish, till it solves the purpose, although it's advisable to take references and do the real characters accordingly. Always research and make sure the proportions are correct.

Each additional mesh or component when added should be considered as a separate control system, so, all joints should be created for each leg arms, fingers, head, ear or tail. Referenced files are not part of the current scene. A path is made to point where the referenced scene file in Maya is. Referenced file use less amount of space and stay locked unless changed, and the update as and when the other artists are working on it. Try and keep the geometry in separate layers so that its easier to reference. Let's start with putting a skeleton in the 3D model that is provided to you.



This tool enables the user to create bones by clicking on the grid

Creating a bone

To create a bone, go in the skeleton menu by choosing Animation in the dropdown box. In any of the Orthographic view that you click will give you a bones. Hit enter when you are done with it. If you click on the joint tool again, and click on bone that already exists, then you can start creating the child of that bone. A hierarchy will be formed when you create a bone from another bones. Always the first bone that is created is the parent and the rest are all children. Also, this parent can have multiple children. Bones can be manipulated by scaling, rotating and moving along the axis, although scaling is unnecessary. Although, when you move , scale or rotate the child bone the parent bone is not affected.

To parent an existing bone to another, select the bone (or multiple bones) that is going to be the child (or children), then select the bone to be the parent and press [P]. To unparent a bone, select the bone and press [Shift] + [P]. Bones are not geometry and usually are not viewed in-game (you can select an option in the Unreal editor to view the bones if you would like to troubleshoot). To name a bone, select it and go to its channel box (the right side with it's move, rotate, scale attributes) and select its name in the grey box under 'channels' (its default name should be joint#) and just type in a new name.

If you do not see the channel box you can select it by going into the menu. Always name your bones and name them in a way that you or anyone else working on the scene understands, this is also very important when you are doing weight mapping. If an error occurs, no one would know which bone was affected. Do not put spaces in your bone names. You can always parent, unparent rename bones in the hypergraph hierarchy. You can also unparent a child bone (or just about anything) in the outliner by clicking the middle button of your mouse and dragging outside the hierarchy.

Channel Box Functions

The channel box is where you can set exact numbers for a bones translate (position), rotation, scale, visibility, and other special attributes. This will show up on the right side of the screen when you select a bone. If it does not, you can access it by selecting in the menus: Display UI Elements Channel Box/Layer Editor. When you want to change the value of a bone's attribute, just select the number field to the right of the attribute, type in the value, and press enter. If you don't want to alter a certain attribute of a bone or mesh, you can hide and/or lock certain attributes. Just select the name of the

attribute, right-click (and hold it) the select lock selected, hide selected, or lock and hide selected.

Channel Box Quick Notes

You can select a bone's attribute in the channel box, then in the display view, middle-click and hold the mouse, then move the mouse left and right to change the attributes. Set Driven Key is a great tool to adjust multiple bones without selecting every one of them. This tool is great for fingers/fists, tails, and other things like that.

To create a new attribute, select Add Attribute from the Modify menu. It will open a window where you will give it a name (in Long Name); make the attribute key able, displayable, or hidden; select its data type (vector: a bunch of numbers; integer: whole numbers like 1, 5, 10; string: name; float: all numbers like 1.5, -56, 85.021; boolean and enum which you will probably never use); and set its numeric attribute properties minimum, maximum, and default value. Clicking OK will add the attribute to whichever bone/object you currently have selected.

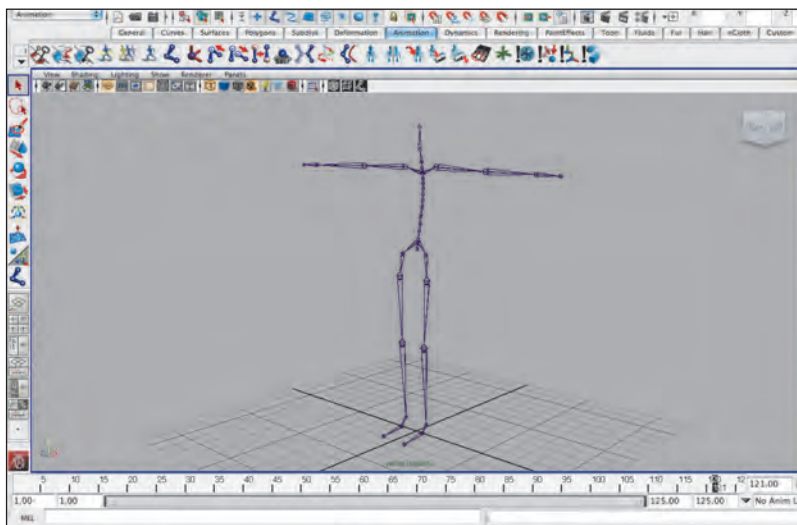
To access Set driven Key, go to Animate > Set Driven Key Set. This opens a box. The driver is an object, which when adjusted, moves the driven. What you will do is load up the bone that is controlling all of the movement into the driver, and then load the bone that is going to be moved into the driven. Select the first bone and click on load driver. This will make the bone names appear in the left box of the driver section. Then, select the attribute that is going to be controlling all of the movements from the right box of the driver section. Now select one of the bones that are going to be controlled by the attribute and select load driven. This should make the bone names appear in the left box of the driven section.

Now you are going to set the default, minimum, and maximum values of how the driven bones is going to be adjusted. Select the bone in the driver section, along with its value to control adjustment of the driven bone, set its adjusting value in the channel box to the default value and press key. Now set its adjusting value to the maximum, select the Driven bone and move it into the position in which you would want it at the maximum value, and press key. Now select the Driver bone again, set its adjusting value to the minimum value, select the Driven bone and move it into the position in which you would want it at the minimum value, and press key. Now, when you adjust the Driver bone's adjusting value, you should see the Driven bone move accordingly.

9.5 Human / Character Animation

Character animation is a specialised area of the animation process concerning the animation of one or more characters featured in an animated work. It is usually as one aspect of a larger production and often made to complement voice acting. Character animation is artistically unique from other animation in that it involves the creation of apparent thought and emotion in addition to physical action.

Open the Maya file called Stickman.mb. Mohamed Warsame has provided this rig on high-end 3D for all Maya users. One of the most interesting thing for an animator is to watch how objects, people and animals move. It makes so much sense to them because they can tell a lot of things just by the way



Have a look at the tutorial on the DVD titled Skeleton 1 and 2

a person walks. First off, you can quickly notice the gender, you can tell the audience if and how fit he/she is. Watch the video titled Character_Animation on this month's DVD.

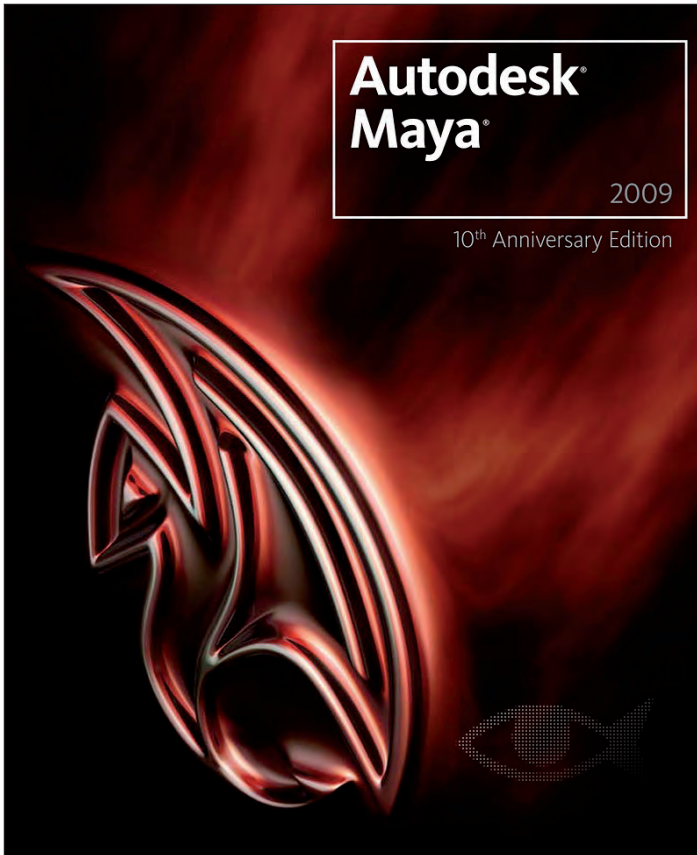
Additional Resources

Hundreds of Maya- and 3D-related resources are available on the Web. For general news about the animation industry, visit Animation World Network (www.awn.com) or Animation Nation (www.animationnation.com). You can find

character animation resources and forums on CGtalk (www.cgtalk.com) and CGChar (www.cgchar-animation.com). Highend3D (www.highend3d.com) and 3D Links (www.3dlinks.com) offer tutorials and forums as well as a nice collection of inspirational images and videos. Other good 3D tutorial and informational sites include 3D Café (www.3dcafe.com) and 3D Ark (www.3dark.com).

Off the Web, Eadweard Muybridge's books of photos (Animals in Motion and The Human Figure in Motion) provide great modeling and animation references. The Animator's Survival Kit by Richard Williams is a great book for aspiring animators to have by their side. **4**

Autodesk Training



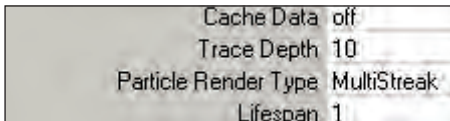
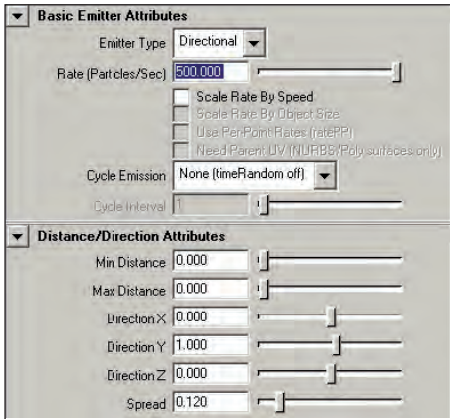
While most of this Fast Track explores the features of Maya, this chapter looks at specific tasks and how to achieve these results. These last few tutorials are for slightly intermediate-level users. It is recommended that you go through the earlier chapters to properly understand the steps here. These tutorials were provided to us by Autodesk. Although the tutorials are written for Maya 2009, you should have little trouble following the steps in the latest version 2010.

10.1 Basic Training

Maya Particles: Fountain

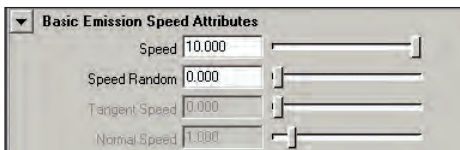
This is a simple workflow to create a fountain. This is pretty elementary and meant for relative new users of Maya dynamics.

Create an particle emitter set this emitter to be directional, and the particle type to be multi streak.

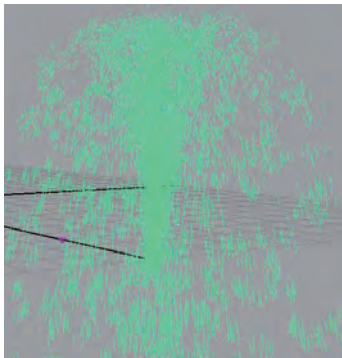


Play a bit (so that particles are emitted). Select the particles and add gravity. Note the particles will not move up on the Y axis as the gravity will pull these down.

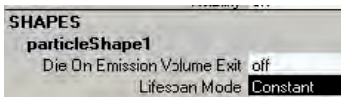
Hence we have to pull up the speed.



We now should have an effect that looks like this...

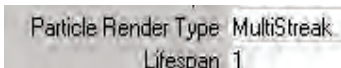


But you'll notice that the particles are going on and on way past the base (where the emitter position is)

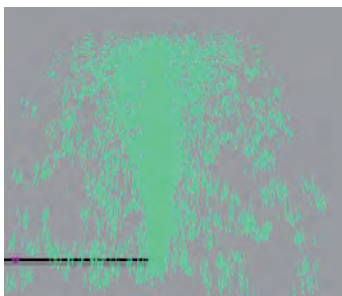


Based on your need, edit the lifetime to be the number of second you really want to see the particles...

Changing the Lifespan Mode from Live forever to Constant. This will then make use of the value.



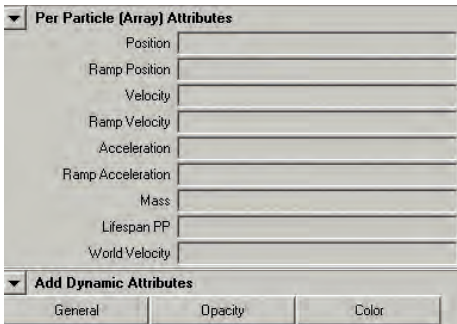
Set at Lifespan. This value is set in seconds. In this example, we've set the lifespan to 2.



Notice here all the particles die of at one particular point. This is so because each and every particle lives the same amount of time. To get a better look it is always advisable to have particles die at their own individual times. Hence set the particle type to lifespan PP.

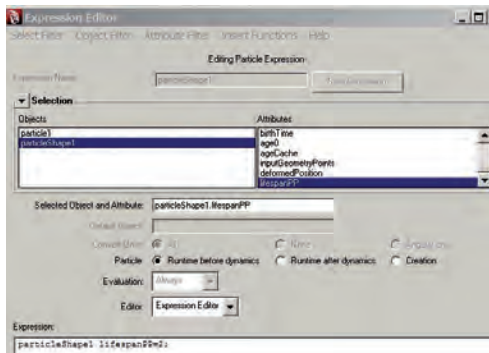


By default, lifespan PP (lifespan per particle) is live forever and hence we have to add changes inside attribute editor.



Right-click on the box at the side of LifespanPP and select runtime expression before dynamics.

This opens the expression editor...



Just to be sure and cross check, we set the value of lifespanPP to 2.

When simulated, this should look identical to the earlier simulation.

So what do we want to do different?

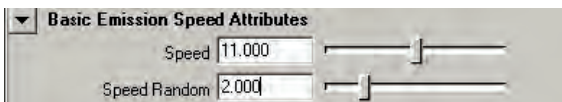
Well, we want that particles to die in around 2 seconds. That is to say, the particles should pick a random value of life between 2 and 3 seconds.

Expression:

```
particleShape1.lifespanPF=rand (2, 3);
```

This will take care that the simulation look does not die off at one time and will also help in the visual look of the particles. This exercise is mainly aimed at the look of the simulation...

Now that we have edited the end of the fountain, let's move to the look of the top of the fountain – this seems too constant. The more nicer look would be a bubbly movement.



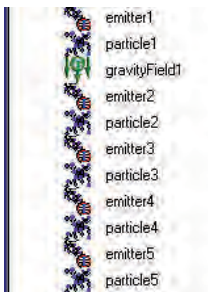
Changing the random value gives just enough movement on the top of the fountain that is needed. In this case, we have added a bit of the speed to compensate.

Now we have something that is neat, probably not the best, but neat.

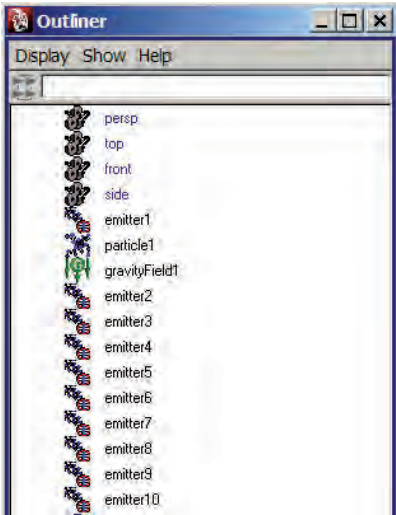
But, what if we have to do a series of fountains?

What if we needed to create 10 such fountains?

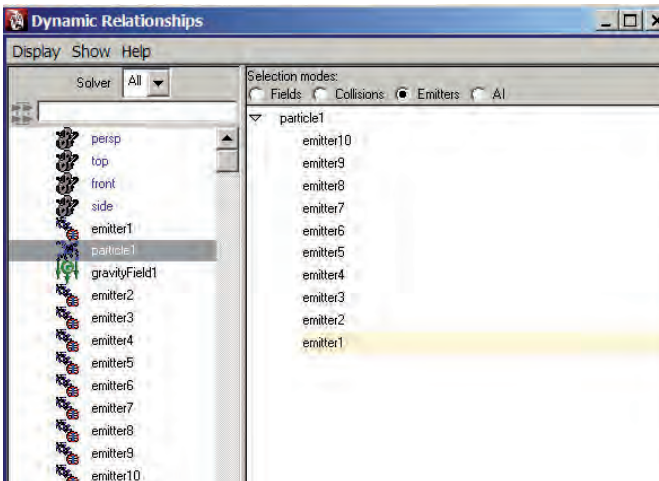
Well we are happy with the particles look, so we do not need any particles from any other emitter. Hence create the required number of emitters (creating emitter automatically creates particle objects.)



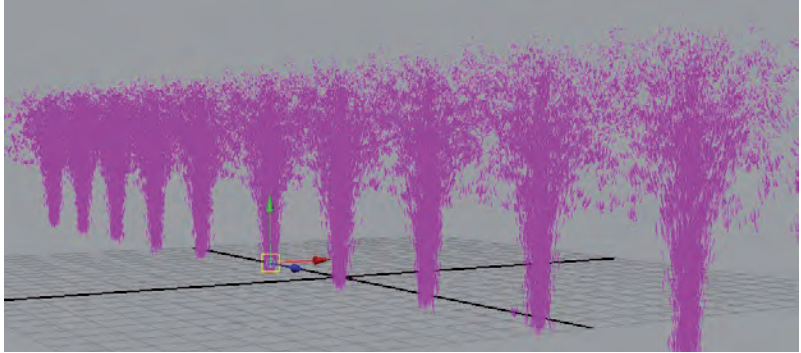
EXCEPT for particle1 delete all the other particle objects



Then open relationship editor > dynamic relations
Select the particle object, we notice here that the particle1 is only connected
of emitter1



Connect this particle object to all the emitters. You should now see particles emitting from all the emitters. Though they may not look like the fountain of the first emitter. The reason is simple – the emitter values are not the same as emitter1.

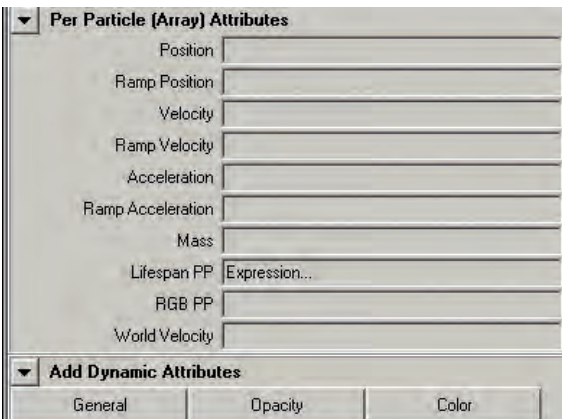


If the values of all the emitters are the same. The image above is what one should get.

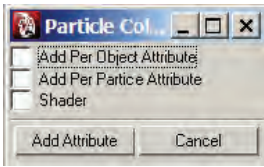
If the look is different, check type (omni/directional), spread, number of particles, direction X & Y.

First of all, let us get the overlook to be nice. Remember the particles are multi-sprite, hence hardware particles.

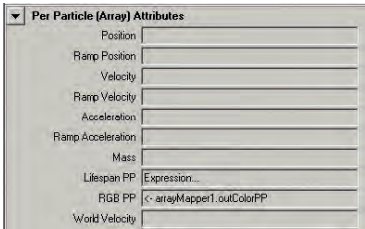
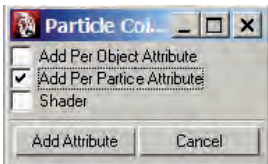
Select the particles and go to the attribute editor



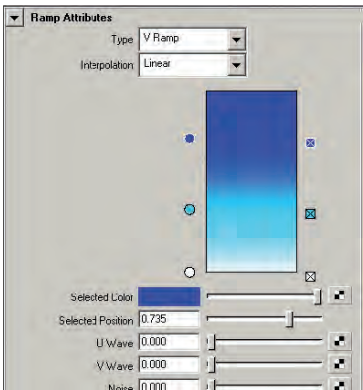
Click on the Color button. This will bring up a window asking how the colour is to be applied.



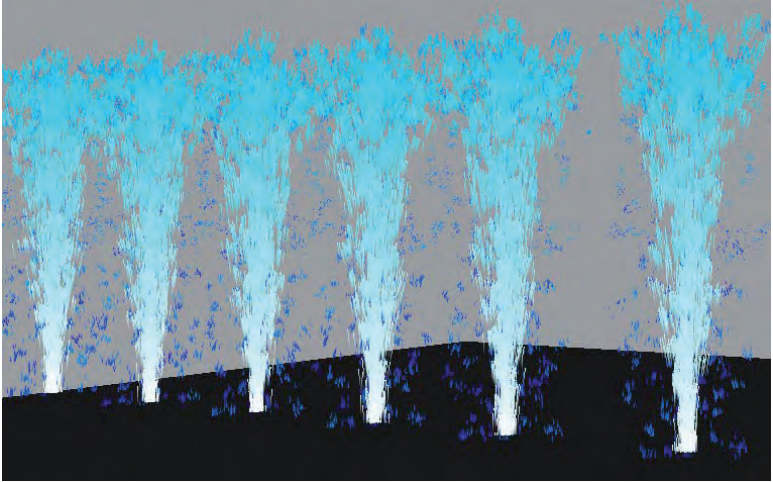
We need the colour to be applied per particle.



Right-click on the RGB PP column and add Ramp. Do the same again, and edit ramp.



Edit the ramp to look like the above, basically a bright-blue to blue ramp. That should give a relative good looking fountain/s.

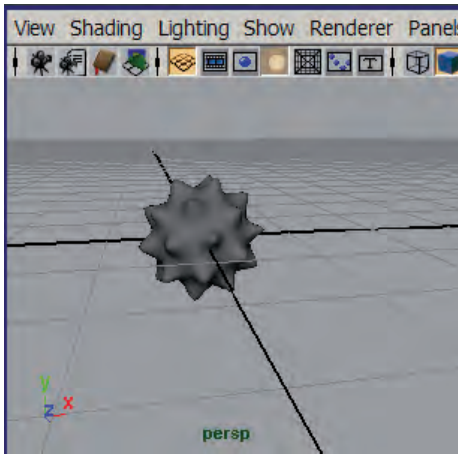


10.2 Camera mapping

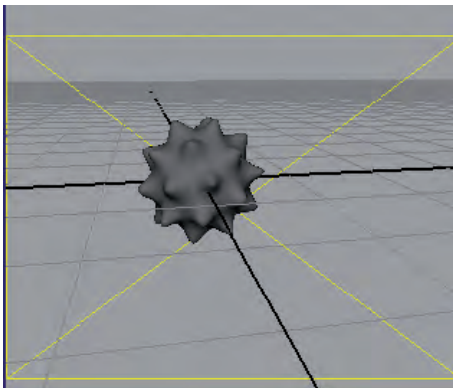
Both in the past as well as present there has often been queries of how to do camera mapping. The idea of this type of mapping is to take the texture from projection through a camera rather than local mapping.

This is often needed for VFX shots. Shots like the object seeming to come out of backgrounds and more often for effects like talking animals etc...

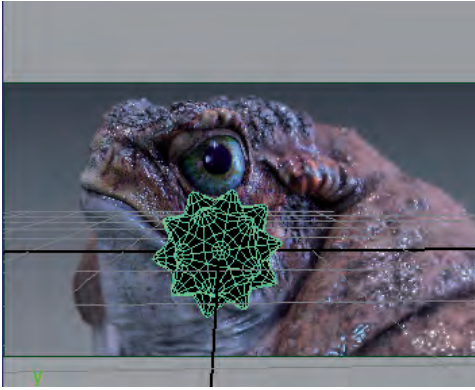
We are going to use much simpler objects to show this example.



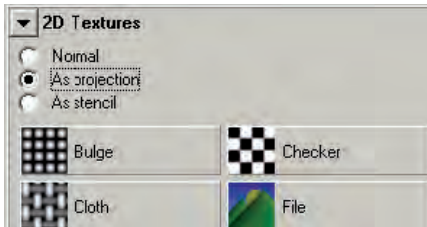
Create a camera or use the persp camera and create an image plane



And put in an image



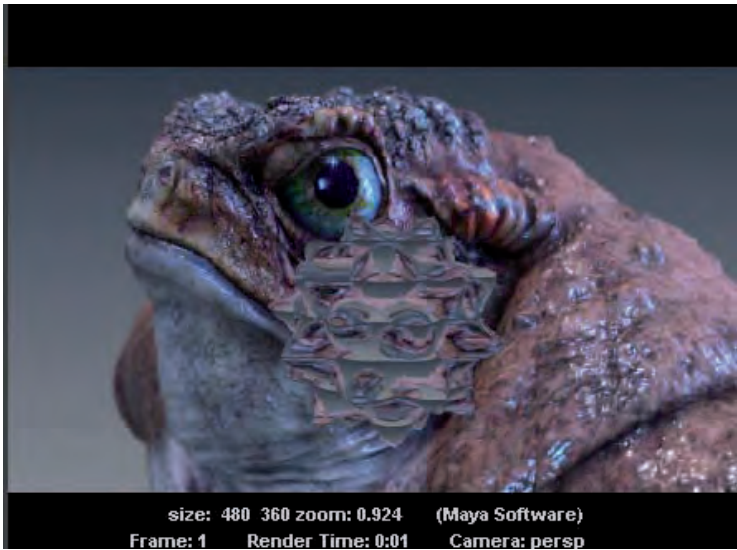
Shade the object with a surface shader as we do not want it to get any highlights or shading. We projection map



the color with an image



The same image as that of our image plane and render this

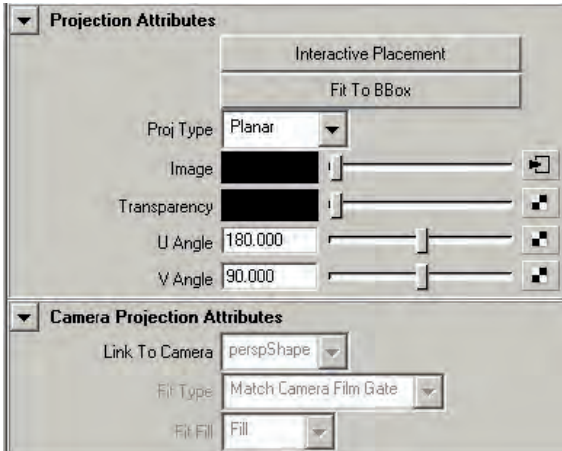


We can notice the background sort of distorted, as the mapping on the object does not match the image in that of the camera plane.

Now we need to tell the object has to get not the planer mapping but mapping from the camera. Select the projection mapping from the hypergraph menu

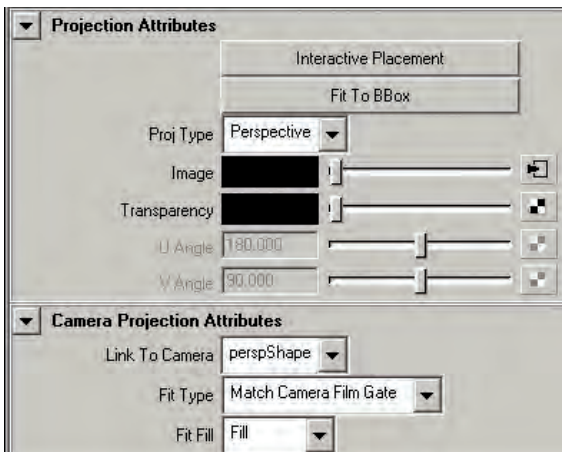


Change the projection type

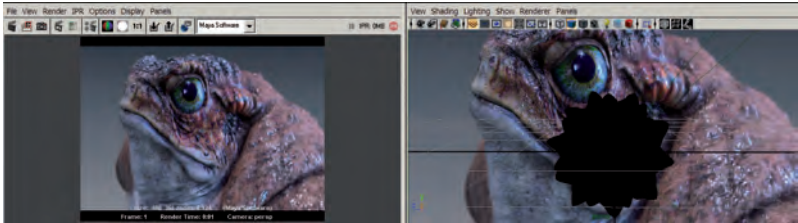


Screen clipping taken: 7/1/2009, 4:52 PM

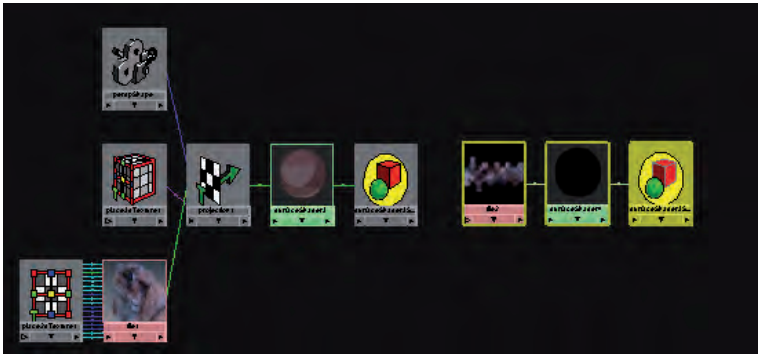
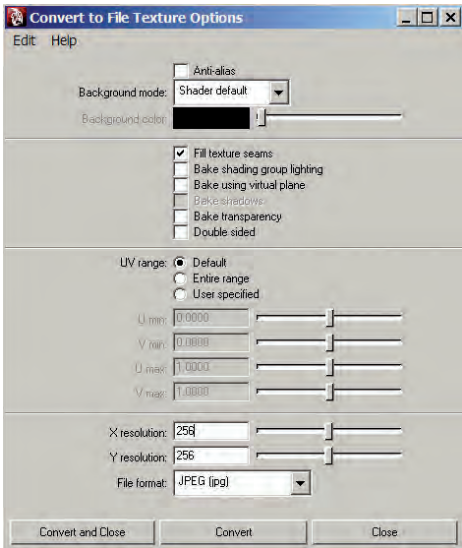
From Planar to Perspective...



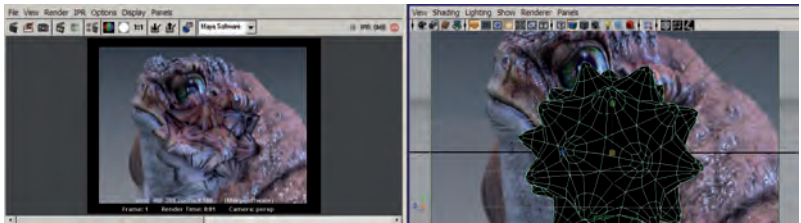
This will then allow us to edit the Camera Projection Attributes what we need is to change the Link to camera and specify from which camera the projection has to take place.



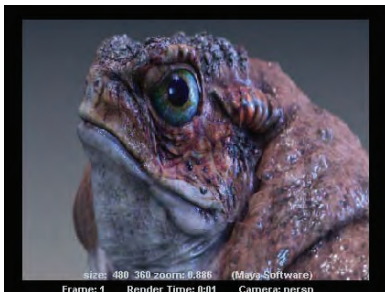
Once this is done, more often we'd want to bake the texture on to the object.



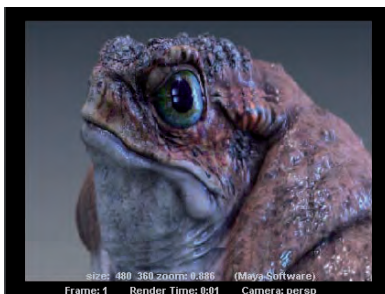
We can then animate the object to come out of the screen or morph to another shape



In the similar way we can make some nice effects ... For example
From a Grumpy toad



To a Toad with a bit of smile

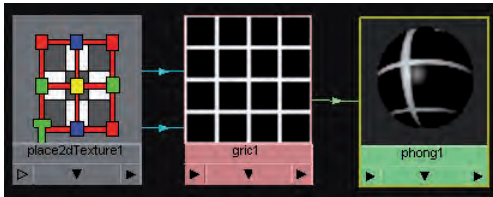
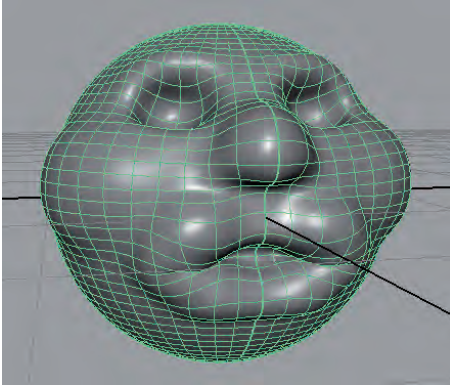


On similar process we can create various expressions as well as talking animals/objects.

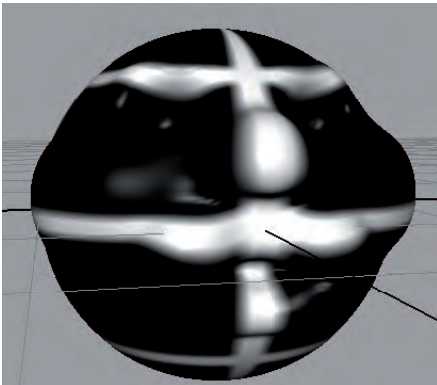
10.3 Styling with Shading network

Create a Simple scene :

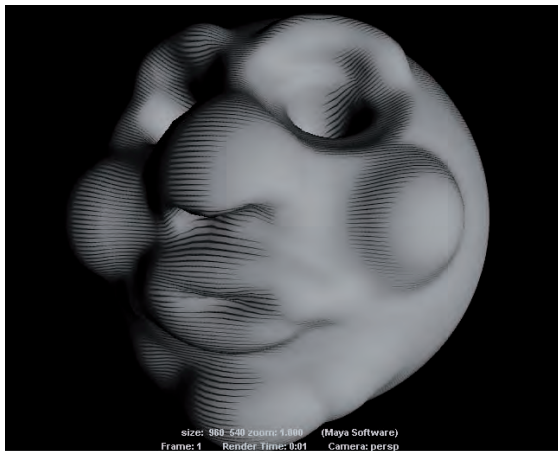
Assign a shader with grid texture



What style we want to achieve this is :



Note here that on changing the orientation of the light the shading changes. Another thing to notice is that the lines are not uniform in thickness, it's



thickness fades towards the specular area.

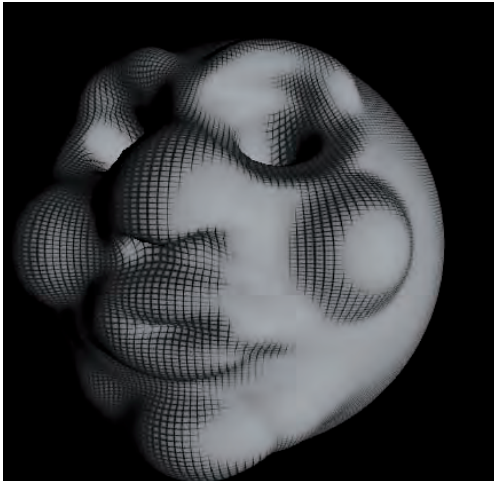
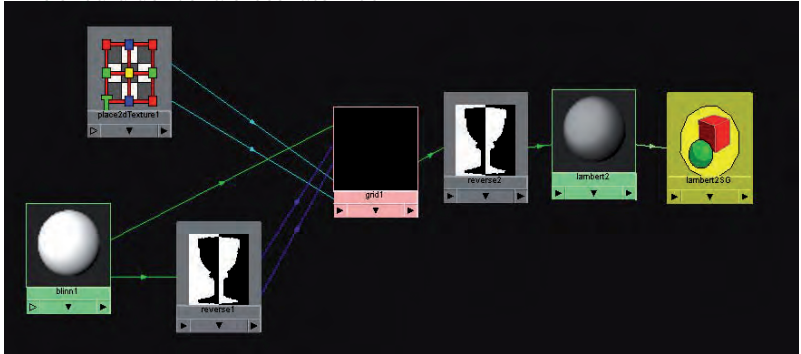


Hence the "curvature" of the surface has to be kept in mind. Take simple shader to get the "shading" hence curvature of the object. Connect the Output color to a reverse node input.

The outputX and outputY of reverse gets connected to grid.uwidth and grid.vwidth

In the Graph above the output color of the blinn is also connected to grid.lineColor.

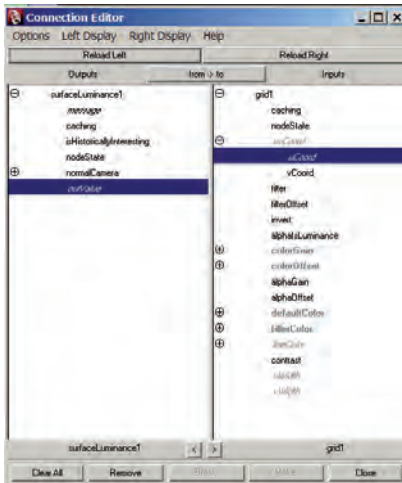
This should deliver a crosshatch look



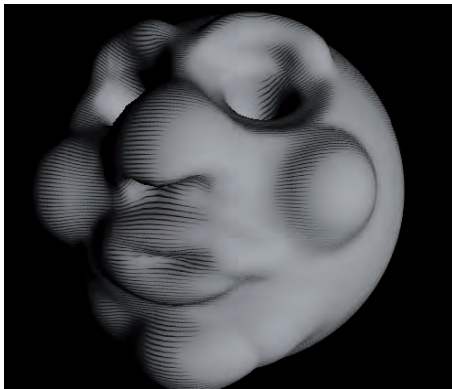
While we can adjust the grid lines and get either more (or Less) horizontal

(or Vertical) line.

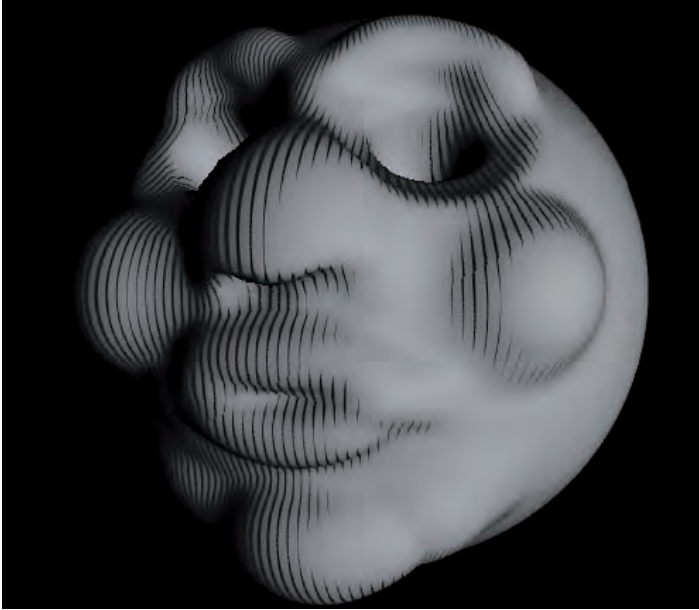
We prefer a surface luminance node to be connected to the Grid.uCord of the



Grid Node to give the horizontal lines



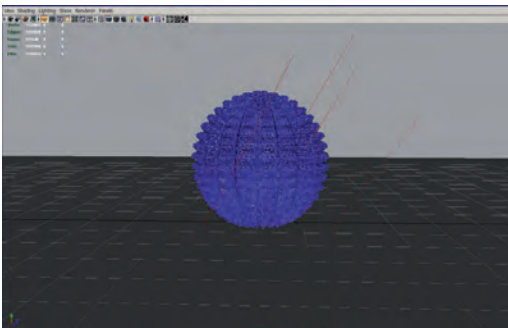
And if we want vertical lines, instead of horizontal lines.
Connect the luminance (surface Luminance) to the vCord (Grid).



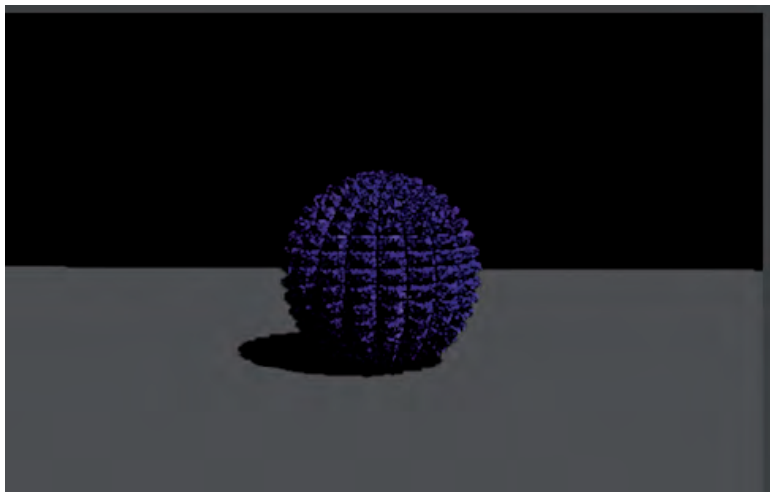
Mental Ray: Geometry Shader

One of the most time consuming aspects of a Computer Graphics pipeline is lighting and rendering. We often have very huge scenes and geometry that can run into thousands and lakhs of polygons. This of course then takes a fair bit of time to render and evaluate.

Even a simple scene file like this, which is just a sphere with extrusions took 42 seconds to render. But if we have to do various changes to the lights



and evaluate the same, this will then take a fair bit of time. Very often making

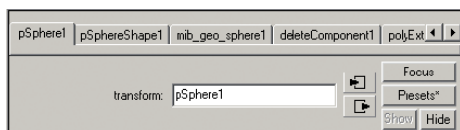


us wonder if we can just replace the geometry with some simple objects, make requisite changes in lighting and then, repute the final high res Go to the transform node in the Attribute editor, Geometry.

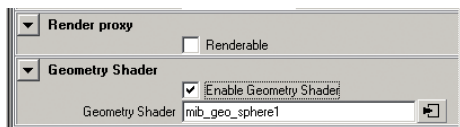
Go to the transform node in the Attribute editor,

Enable the Geometry shader

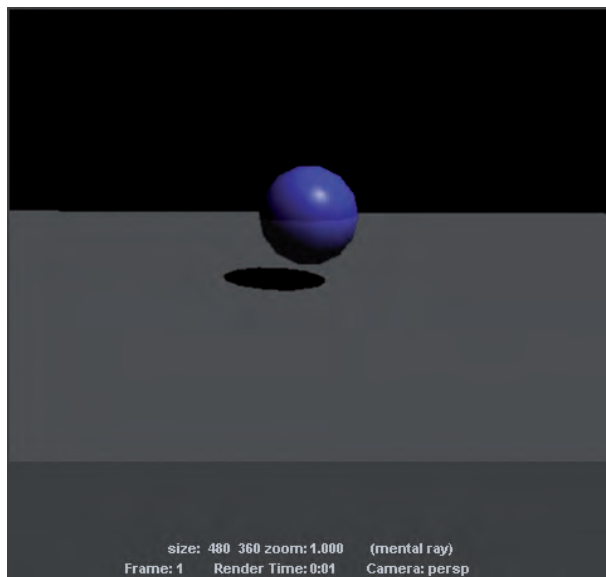
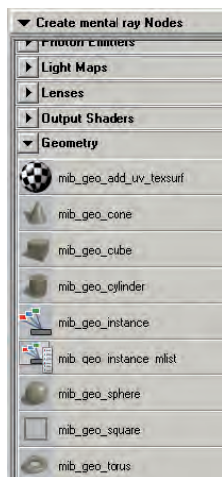
Select which Mental Ray geometry shape matches closely to the scene



geometry.

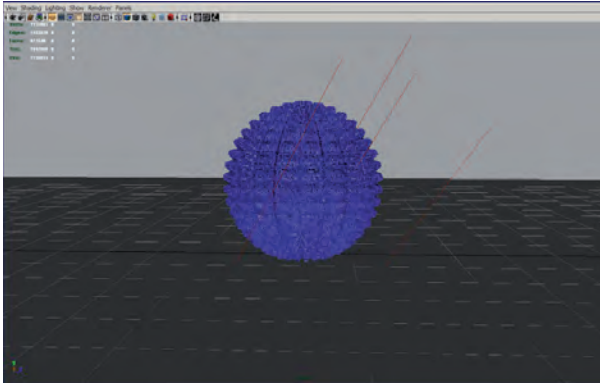


The scene geometry gets replaced with a simple Mental Ray primitive and renders in a fraction of time.



But the look of the geometry in the viewport remains the same

This is a simple but intuitive way of using geometry shaders. Note here that this is not the only usage of geometry shaders, the more advanced uses



will be discussed in a later topic. **d**